SUPPLEMENT—JUNE 2, 1909.

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INDEX TO VOLUME XIX.

THE

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OF

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Agricultural Gazette of New South Wales.

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SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from December, 1907, page 906.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

VIII.

Tribe ABIETINEÆ.

Sub-tribe 1.—*Pineæ.*

14. Pinus.

Sub-tribe 2.—*Lariceæ.*

15. Larix.
16. Laricopsis.
17. Cedrus.

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18. Picea.
19. Tsuga.
20. Abietia.
21. Abies.

Sub-tribe 1.—*Pineæ.*

14. Pinus.

Over 70 species of this well-defined genus have been described. Not many of them are at their best in the Sydney district, but most of them will undoubtedly do well in one part or other of New South Wales. At present we confine our attention, in this State, almost exclusively to *P. radiata* (*insignis*), *Pinaster*, *pinea*, and *halepensis*, and exhibit too little enterprise in trying other species of this beautiful, health-promoting and interesting genus. The seed is quite cheap, and can readily be imported if local seedsmen do not have that of any particular species in stock.

(1.) *P. Ayacahuite*, Ehrenberg. The "Ayacahuite" of Mexico. The common "White Pine" of Mexico.

A graceful Pine, tender in many parts of Britain, and probably quite hardy in parts of New South Wales.

Araucaria Bidwillii, Hook.
Camden Park, N.S.W.
(See December, 1906, page 903.)

Pinus canariensis, Ch. Smith.
Botanic Gardens, Sydney.

(2.) ***P. canariensis***, Ch. Smith. "Canary Pine."

Native of the Canary Islands. See *Gard. Chron.* 1888, iii, 723, f. 94.

A beautiful long-leaved Pine which does well in comparatively dry situations and calcareous soils. It does only indifferently well in Sydney, but is a very useful tree in many parts of the State.

L 7, 17, 32 (Sydney Botanic Gardens).

(3.) ***P. Cembra***, L. "Swiss Pine."

This is a cold country Pine which just exists in the Sydney district. It should be well tried in the coldest regions.

(4.) ***P. cembroides***, Zucc. (*P. fertilis*, Roezl.) "Mexican Swamp Pine."

The seeds are edible. We have not been very successful with this tree in the Sydney district, but steps are being taken to give it a further trial.

It will probably be found suitable in cooler situations.

L 30 b (Sydney Botanic Gardens).

(5.) ***P. contorta***, Douglas. "Oregon Scrub Pine."

Is a small scrubby tree which inhabits the sandy dunes and exposed promontories of the Pacific Coast from Mendocino northwards to Alaska. It may be added to the list of trees and shrubs more or less useful for covering sand-dunes and preventing land slips, and is listed here with that view.

(6.) ***P. Coulteri***, Don. "Coulter's Pine."

A large tree, remarkable for its very large cones. It does fairly well in the Sydney district (better at Campbelltown), and in many cooler parts of New South Wales, but in our experience it is not dense-foliaged and hence not very popular. At the same time further experiments should be made with it.

(7.) ***P. densiflora***, Sieb. and Zucc. "Akamatsu Pine." See Sieb. and Zucc., *Flora Japonica*, ii, 22, t. 112. Japan.

This Japanese Pine has never done well in the Sydney Botanic Gardens. It requires colder localities and is worthy of extended trial.

(8.) ***P. excelsa***, Wallich. "Himalayan Pine." "Lofty or Bhotan Pine." Temperate Himalaya.

This tree has been tried in the Sydney Botanic Gardens for many years, but it always suffers during the droughts of summer. It is a beautiful and a very large tree and can be confidently recommended for cool localities where good soil is available.

L 15 b, 29 c (Sydney Botanic Gardens).

(9.) ***P. halepensis***, Miller. The "Jerusalem or Aleppo Pine." See *Gard. Chron.* 1884, xxii, 553, f. 97; 1888, iii, 629, f. 84.

Native of South Europe to Afghanistan.

A tall tree, but, in the Sydney district, liable, during the last few years, to an insect disease (a Coccid, *Dactlylopus sp.*) which has almost thrown it out of cultivation.

Pinus Coulteri, Don.

State Nursery, Campbelltown.

Pinus excelsa, Wallich.
State Nursery, Campbelltown.

Pinus Laricio, Poiret.
State Nursery, Campbelltown.

It prefers calcareous soil, and a drier climate than Sydney. It does admirably in Adelaide and many parts of South Australia, and will flourish in many parts of our State also.

In its best development it is a very large, handsome tree, with large branches of very dense foliage.

L 7, 33, 35 (Sydney Botanic Gardens).

(10.) ***P. Hartwegii***, Lindl. (Syn. ***P. Ehrenbergii***, Endl.) Mexico.

This has never made a good plant in the Sydney Botanic Gardens, being always thin and spindly. It should be more thoroughly tested in New South Wales.

(11.) ***P. heterophylla***, Ell. "Cuban Pine."

Prof. B. E. Fernow says that this species is in the very first rank of timber pines in the United States.

It should therefore be given a thorough trial here.

(12.) ***P. Koraiensis***, Sieb. and Zucc. "Corean Pine."

Native of Corea, China, and Japan.

For a figure of the remarkable and handsome cone, see *Veitch's Manual.* It is often planted in Japan, where it attains imposing dimensions.

Sydney is too warm for it, and it is hence a poor grower in the Sydney Botanic Gardens; but it should certainly find a place in gardens and plantations in colder districts.

L 15 b (Sydney Botanic Gardens).

(13.) ***P. Lambertiana***, Dougl. "Sugar Pine."

Native of California, Oregon, and British Columbia.

Sargent, tt. 542, 543.

A gigantic tree in its native country, being the loftiest of all pines, attaining a height of 300 feet.

It yields a well-known and valuable timber, and Professor B. E. Fernow classifies it as one of the best timber pines in the United States.

The Sydney district is too warm for it, but it is certainly a valuable tree for the cold districts.

L 5 (Sydney Botanic Gardens).

(14.) ***P. Laricio***, Poiret. "Corsican Pine." "Larch Pine."

Native of South Europe and the Levant.

The most useful tree for general forestry planting in Great Britain.

It does fairly well in Sydney. Our tree has been a good specimen, but it is now past its prime. This pine should be well tested in the coast districts.

L 7 (Sydney Botanic Gardens).

Var. ***austriaca*** (***P. austriaca***, Höss). "Austrian Pine."

It is a smaller and more inland tree than the preceding, and promises best away from the coast.

L 17 (Sydney Botanic Gardens).

(To be continued.)

Sheep at Bathurst Experimental Farm.

R. W. PEACOCK.

THE following notes are supplementary of others upon this subject, and give the average weights of the fleeces of the various crosses for 1907. The actual weights represent thirteen months' wool; weights equivalent to twelve months' growth are given.

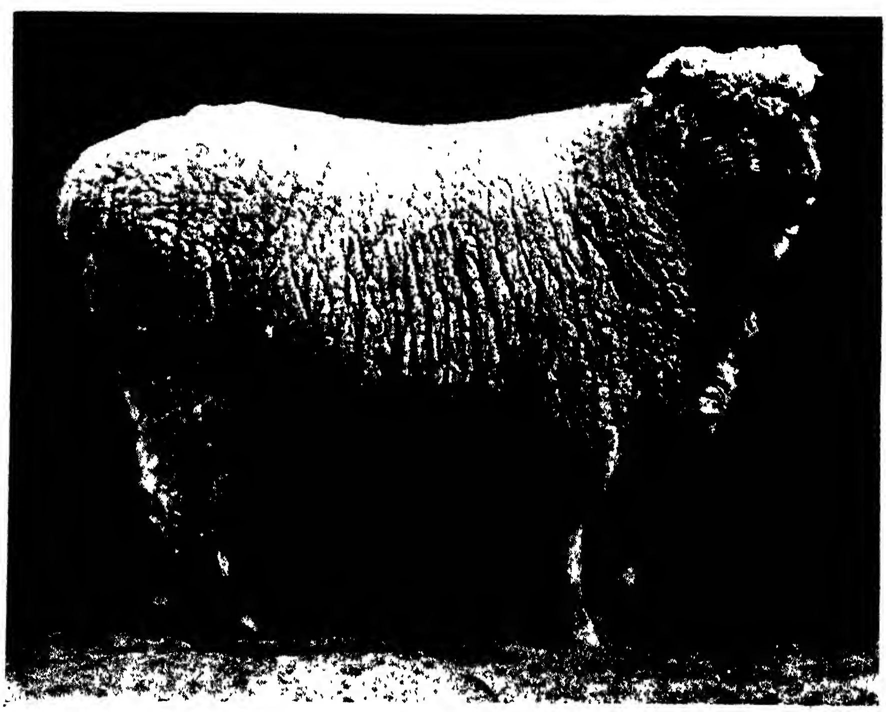
Merino Ram. 8-tooth.

Owing to the very dry weather of the spring, the wool was very dirty, especially the backs, they containing a large proportion of dust from the roads. Fully 1 lb. each should be deducted for this.

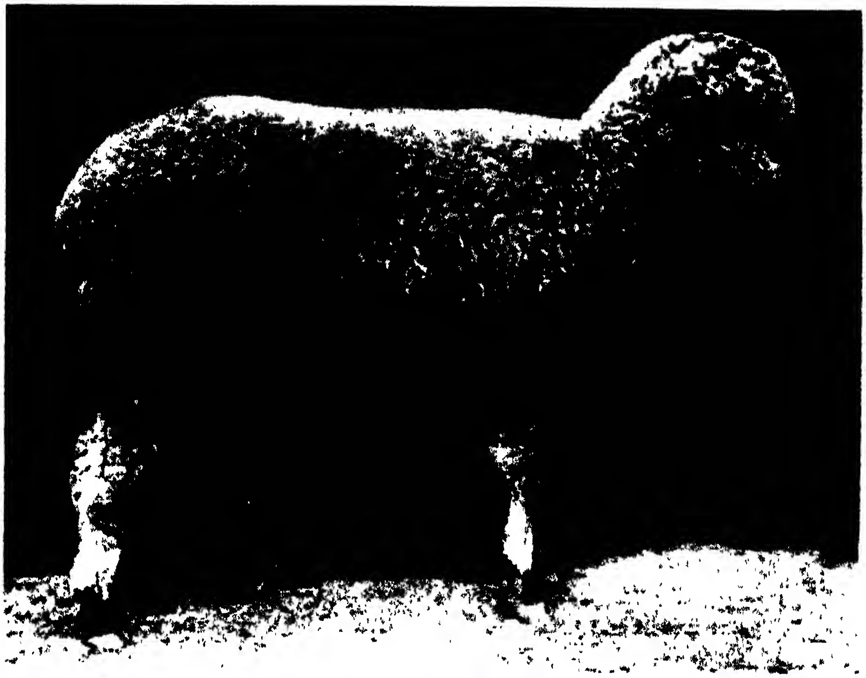
The photographs shown give some idea of the rams used for crossing purposes, and also of the progeny. The rams were purchased from reputable breeders, and are typical of the breeds. They appear in flock condition, nothing being done to improve their appearance.

The following are the average weights of fleeces:—

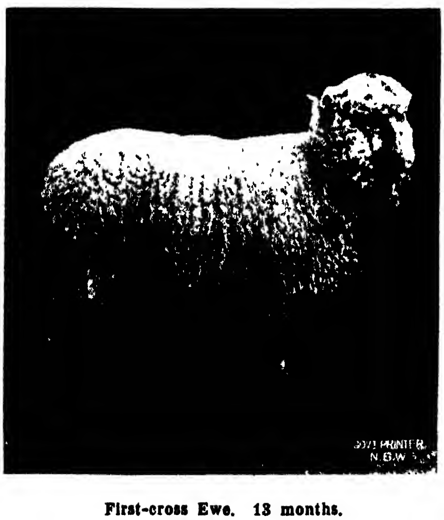
	13 months' wool lb.	oz.	= to	12 months' wool. lb.	oz.
Lincoln-Merino, cross-bred	11	12	=	10	13
English Leicester-Merino, cross-bred	11	9	=	10	10
Shropshire-Merino ,, ...	10	8	=	9	11
Border Leicester-Merino ,, ...	10	1	=	9	4
Southdown-Merino ,, ...	8	2	=	7	8
Merino ram on Lincoln-Merino ewe, Comeback	14	4	=	13	2
,, English Leicester-Merino ewe, Comeback ..	12	15		11	15
,, Border Leicester-Merino ewe ,, ..	12	4	=	11	4
Lincoln ram on Shropshire-Merino ewe, second cross ...	12	12	=	11	12
Shropshire ram on Border Leicester-Merino ewe, second cross	10	0	=	9	3
Southdown ram on Southdown-Merino ewe	8	8		7	13



Shropshire Ram. 6-tooth.

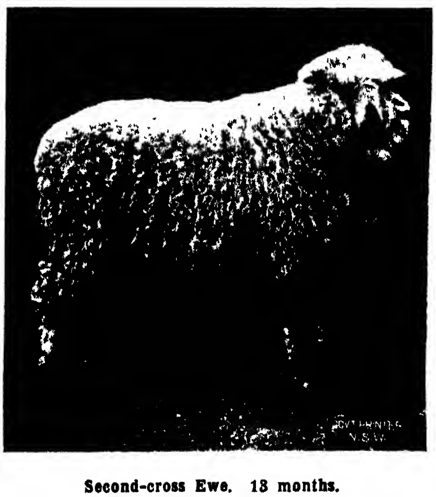


First-cross Shropshire-Merino. 4-tooth.



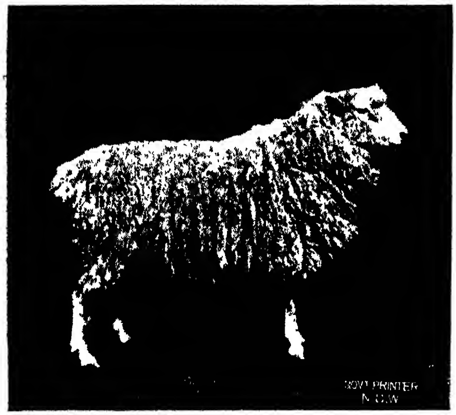
First-cross Ewe. 13 months.

By Shropshire ram from Merino ewe.



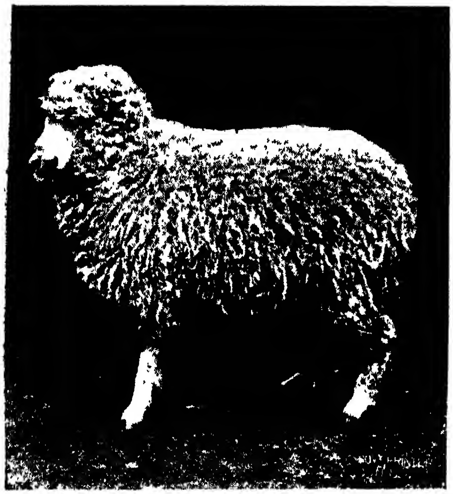
Second-cross Ewe. 13 months.

By Shropshire ram from Border Leicester-Merino ewe.

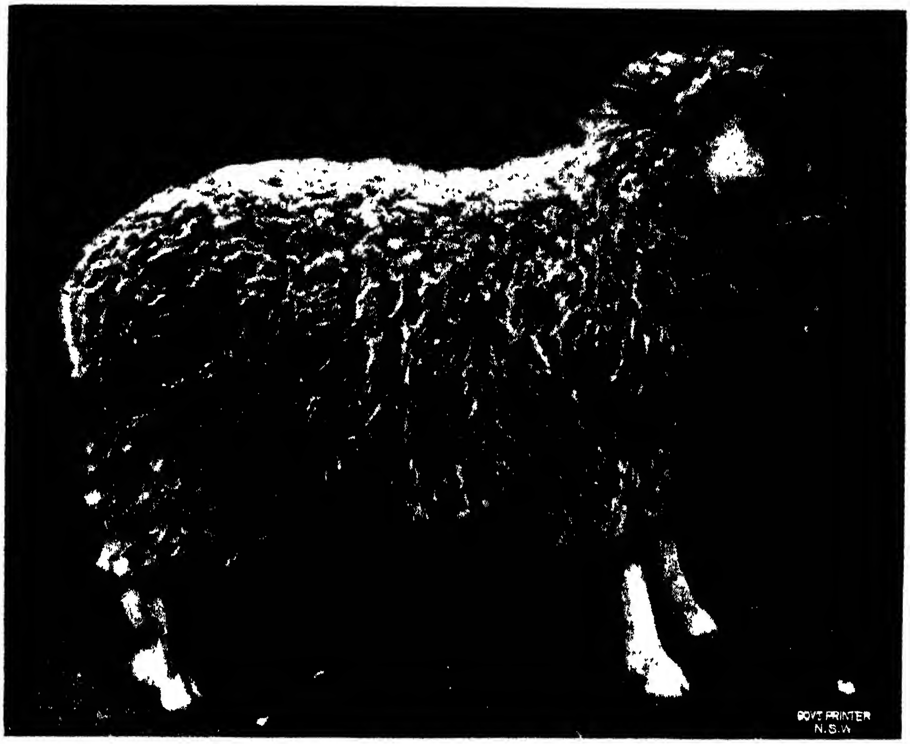


Lincoln Ram.

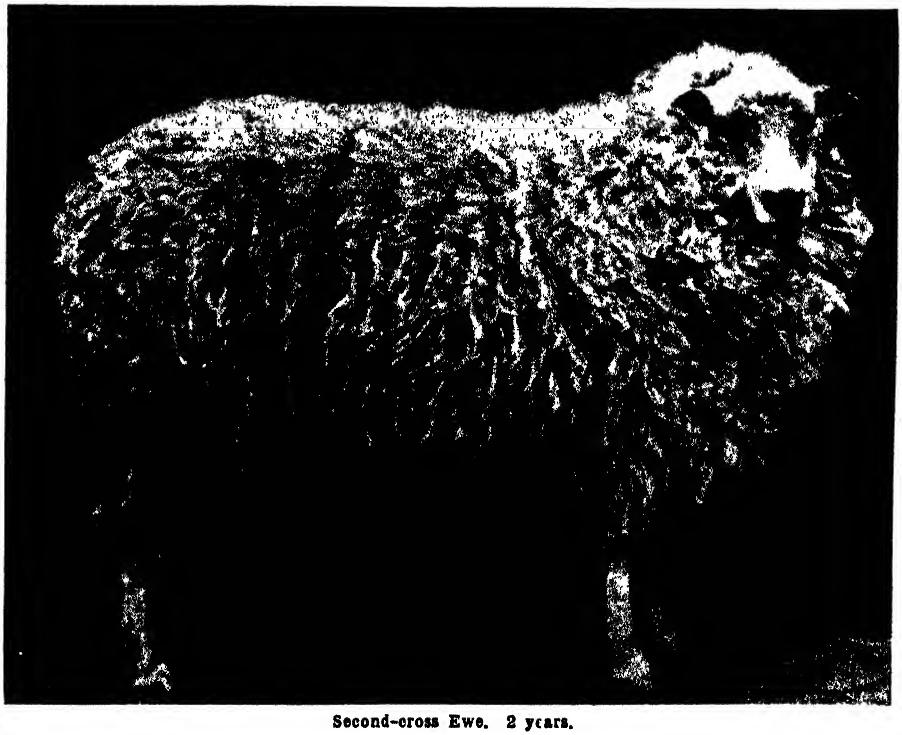
First-cross Ewe. 2 years.
By Lincoln ram from Merino ewe.



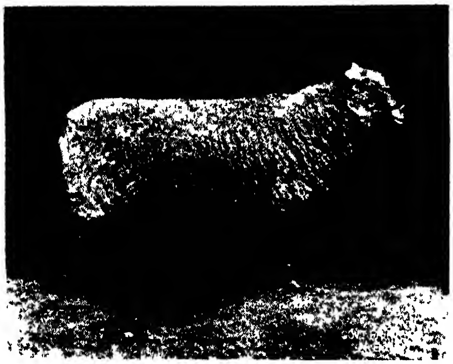
First-cross Ewe. 13 months.
By Lincoln ram from Merino ewe.



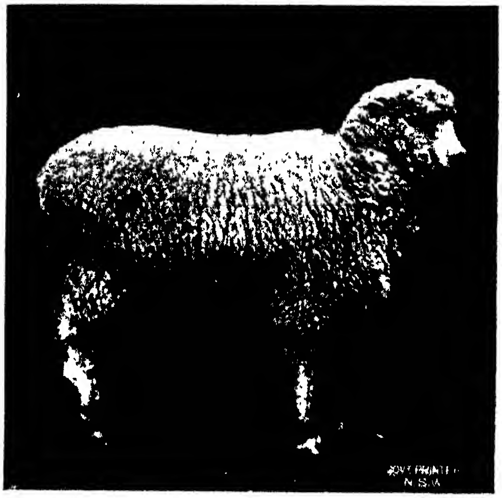
Second-cross Ewe, Hoggett. 13 months.
By Lincoln ram from Shropshire-Merino ewe.



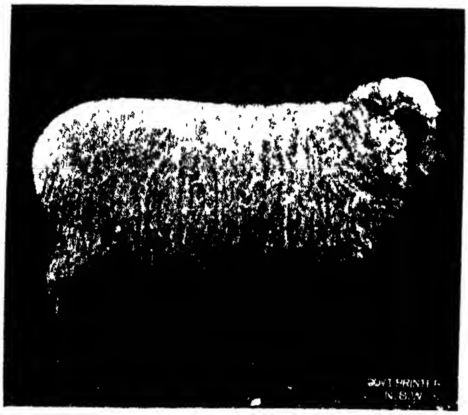
Second-cross Ewe. 2 years.



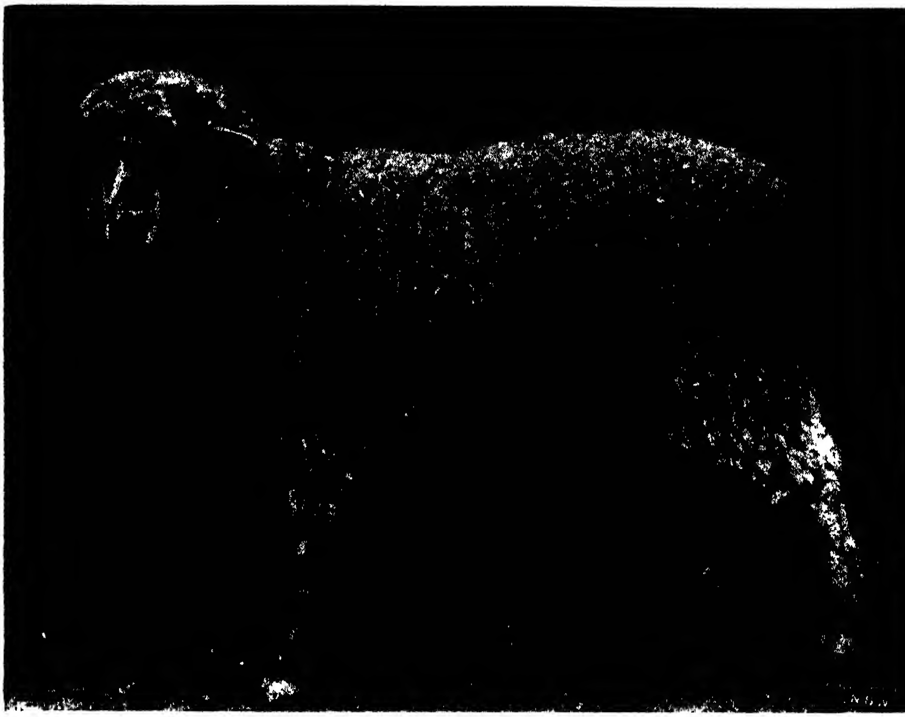
Southdown Ram.



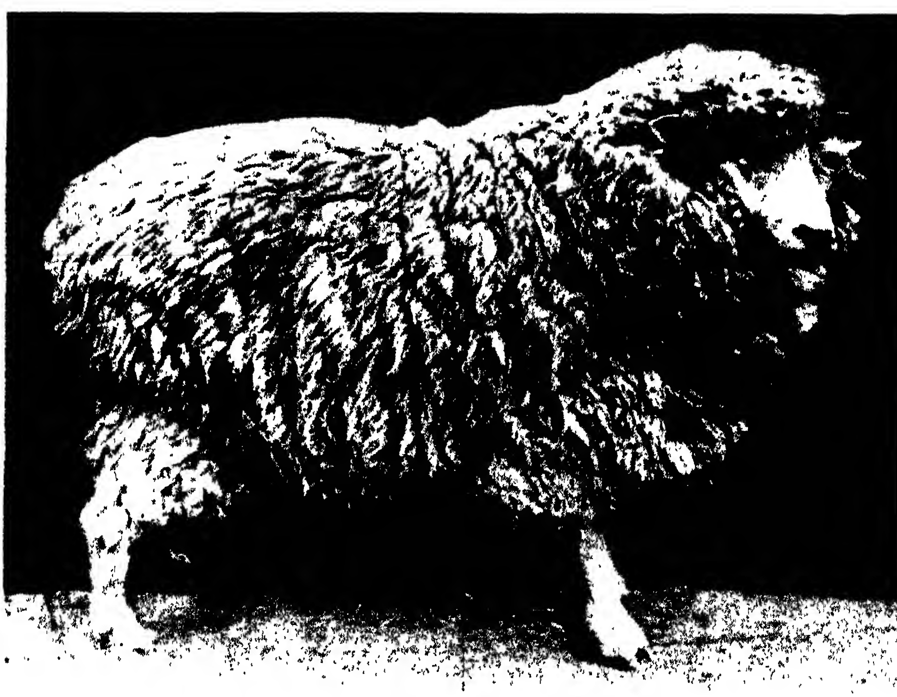
First-cross Wether. 13 months.
By Southdown ram from Merino ewe.



Three-quarter-bred
Southdown-Merino Ewe. 2 years.
By Southdown ram from Southdown-Merino ewe.



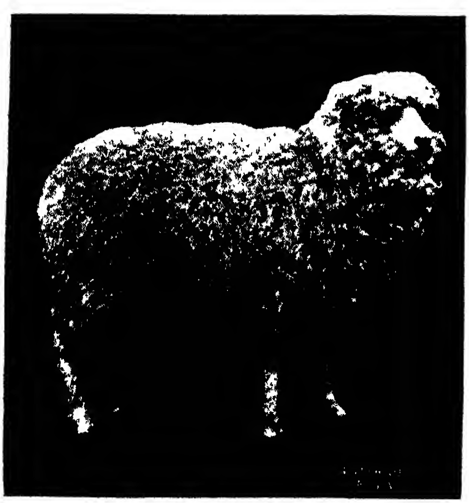
First-cross Wether. 2 years.
By Southdown ram from Merino ewe.



Romney Marsh Ram.

English Leicester Ram.

First-cross English Leicester-Merino. 2 years.
By English Leicester ram from Merino ewe.



First-cross Ewe. 13 months.
By English Leicester ram from Merino ewe.

Growing Fodder Crops under Irrigation (Pera Bore).

W. J. ALLEN.

As there have been contradictory reports from time to time as to the suitability or otherwise of artesian water for growing crops, the Department of Agriculture thought it advisable to settle the question by carrying on a series of experiments to cover a period of at least five years, during

Lucerne Plot, under irrigation; young plants just up.

which time crops were to be grown continuously on the same land under a proper system of irrigation—such crops as sorghums, corn, &c., to be sown in drills and irrigated from time to time, whenever it was found necessary, by running water down furrows made with the plough between the rows. After each irrigation, while the crops were young, the furrows were to be

cultivated as soon as they were dry enough, and in this way the surface soil was to be kept in a thorough state of cultivation, in order to prevent evapora-

First Crop—Kaffir Corn.

Second Crop—Kaffir Corn.

tion, and to keep the crops in the best possible condition. It is well known that crops will not do nearly so well in hard, baked soil as in that which is

well cultivated, even though the subsoil in each instance was well supplied with moisture. Also, when a thorough system of cultivation is carried on, less water is required to produce a crop than where water is run down the furrows and these not cultivated in as soon as dry enough, if at all.

In growing lucerne, it will be found advantageous in most cases—particularly when the head of water is only a limited one, and does not admit of flooding the crop quickly—to run shallow furrows at distances of from 4 to 8 feet apart, according to the nature of the soil, a heavy soil requiring

Rhodes Grass (*Chloris Gayana* **var.**).
(Four months after sowing.)

them closer than a porous one; such furrows to be made after the land is properly levelled and the seed sown.

It is best to sow the seed as soon as the land is in fit condition, either after a rain or an irrigation, and no further watering should be given until the young crop is well up, else the surface soil will harden, and the result may be that the seed will not come up evenly, and, in consequence, a further sowing might be necessary to get a good stand. Seed may be either broadcast or sown with a drill; but unless one is accustomed to sowing seed by hand, it will be found rather difficult to get as even a stand as with a drill, and they will require to sow a greater quantity of seed.

Grasses.—These are sown in drills, many of them making very fair growth; but out of ten varieties there was nothing which, when compared with the Rhodes Grass, was considered worth growing. This variety stood out ahead of all others, *Paspalum dilatatum* not holding a candle to it. When once the Rhodes Grass is established, it appears to do remarkably well with but very little irrigation—as a matter of fact, it had only one irrigation last year; but we were fortunate in getting two or three good heavy summer rains, which supplied it with all the moisture it required.

Black Sorghum.

The officers of the Department are of opinion that with any kind of systematic cultivation, in conjunction with irrigation, at least good fodder crops can be grown wherever bore water is available in this State, and that on moderately light soils lucerne can be profitably grown. On the heaviest soils, where, perhaps, lucerne will not do well, some of the very best crops of sorghum can be grown.

The ground in which we have started these experiments at this bore has been under crop for at least two years out of three during the past ten years, and I fail to see that it is in any worse condition to-day than it was after the first crop was taken off it.

We have not turned our attention to the making of ensilage here, but we have shown for the last ten years at our larger farms how to make this, not only in the stack, but in the pit and tub silos; so that there is very little need for going in for it here, where we do not carry stock of any kind beyond the horses necessary for working the orchard and experimental plots.

Last year our wheaten hay crop proved a failure, owing to rust attacking it just about the time it was ready for cutting, when continuous rains, lasting for nearly a fortnight, flooded the ground and spoilt the crop. This year we have tried John Brown and Plover, both of which are fairly rust-resistant varieties. John Brown has done very much better and yielded heavier crops than Plover. Next year we will, in all probability, try three or four other good varieties.

Wheat for Hay; variety, John Brown.

The following are the weights of the green crops taken from 1 acre:—

NOTES on Sorghums, Millets, &c., grown at Pera Bore.

Variety.	Date when sown.	Date when cut.	Yield per acre			
		First Crop.				
			tons	cwt.	qrs.	lb.
Sorghum Saccharatum	30 Oct., 1906	30 Jan., 1907	13	8	1	12
Amber Cane	30 ,,	30 ,,	11	4	0	0
Planters' Friend	30 ,,	1 Mar., 1907	14	1	2	0
Kaffir Corn	30 ,,	1 ,,	10	15	1	0
White French Millet	22 ,,	21 Jan., 1907	1	1	3	14
Golden Millet	22 ,,	21 ,,	0	18	3	20
Japanese Millet	22 ,,	21 ,,	1	9	3	8
Hungarian Millet	22 ,,	21 ,,	2	5	3	11
		Second Crop.				
Sorghum Saccharatum	....	8 April, 1907	10	2	2	8
Amber Cane	... .	8 ,,	8	19	3	20
Planters' Friend	....	26 June, 1907	4	5	0	24
Kaffir Corn	....	26 ,,	8	12	1	12
		Main Corn Crop.				
			bush.	lb.		
Pride of the North (yellow)	3 Nov., 1906	25 Mar., 1907	32	10		
Iowa Silvermine (white)	3 ,,	25 ,,	33	20		

Sorghums.—A reference to the yields before mentioned will show that some varieties have done very well, and would prove very profitable to grow for either ensilage-making or for green feed during the summer months, when grass is usually rather scarce.

Millets.—These have not given us anything like satisfactory yields; the Hungarian produced the best crop.

Grasses.—The following are the grasses we are testing, viz.:—

Triraphis mollis (Purple Head).
Eriochloa punctata (Early Spring Grass).
Panicum decompositum (Australian Millet).
Diplachne fusca (Brown-flowered Swamp Grass).
Sporobolus Lindleyi (Pretty Sporobolus).
Chloris Gayana, var. (Rhodes Grass).
Blue Grass.
Paspalum dilatatum.
Mitchell Grass.
Umbrella Grass.
Johnston Grass.

First Crop—Amber Cane.

Carob Beans (two varieties).—Small tree yielded 131 lb. beans; large tree yielded 120 lb. beans.

Lucerne.—Owing to pressure of work, we were not able to sow any last year, but have recently put in a plot (see illustration), which we hope will make good headway this season. There was some sown twelve years ago, but as it could only be watered occasionally during the summer when the trees

required most of the water, it did not have a fair chance. Still, these old plots have produced a good many tons of hay. They are now being used for grazing purposes, and will be until such time as we can see our way to regrading them, and if we consider we have sufficient water to give them an occasional irrigation, sowing them to either Rhodes Grass or lucerne.

Planters' Friend.

The R.A.S. Annual, 1907.

There has lately been published by the Royal Agricultural Society of New South Wales the second Annual, compiled and edited under the authority of the Council by Mr. H. M. Somer, Secretary to the Society.

The 1907 Annual, which is considerably larger than the first one issued in 1906, should find a place on the bookshelf of every progressive farmer. The book is presented free to members, but to others it is for sale at the very moderate price of 2s. 6d. The Annual contains many excellent articles by prominent authorities, embracing Agriculture, Beef Cattle, Dairy Cattle, Horses, Pigs, Poultry, The Royal Agricultural Society—Historical Sketch, Financial Position, List of Members, Judges, etc.—Sheep (British Breeds), Wine Judging, The State in Relation to Agriculture, The Prize List for 1907, and other useful information not readily obtainable elsewhere.

The Annual is very interesting, is full of information, and well illustrated.

Hawkesbury Agricultural College and Experimental Farm.

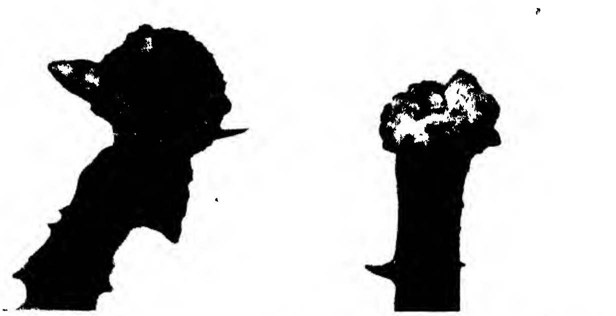
Plant Propagation.

[Continued from December, 1907, page 944.]

HUGH REID,
Gardener, Hawkesbury Agricultural College.

Propagation by Layers.

A LAYER is a branch or shoot, part of which is introduced into the soil, and strikes root whilst being fed by the parent plant, with which, however, its communication is partially interrupted to induce the returning sap to form roots where checked, instead of returning to the parent stock. It has already been stated that when absorbed by the roots, the sap passes upwards through the alburnum or cambium layer, and the youngest layers of wood, to the leaves, and that having been exposed in the tissue of these to the influence of light, it returns by the liber or inner bark, forming woody matter and



A Callus formed on the end of a cutting that has been buried upside down previous to being set out in the ground to strike.
(See December, 1907, page 943.)

depositing secretions in its progress, a portion extending to the roots, to which it supplies organised matter for the growth of the spongioles (the tiny whitish portions at the extremities of the roots for absorbing water). As the upward flow of sap is by the young wood, it is evident that we may cut off from a branch a ring of bark, including the liber or inner bark, without stopping the flow of sap by the alburnum. The returning sap will, however, be deprived of its regular channel when it reaches the place where the outer and inner bark were removed by ringing. If this part is kept in dry air, the obstructed sap forms a swelling on the upper edge of the ringed space, or if it protrudes a little in the form of a cellular tissue, it soon dries,

exhibiting a margin of irregular excrescences, but when the ringed portion is placed in the soil, the cellular tissue, protected from the drying influence of the air, forms granulations, which by degrees elongate and assume the form and office of spongioles. It is upon these principles that the operation of layering is founded. The shoot or branch is kept alive by the flow of sap from the parent, and various means are adopted to check its return, and induce the formation of roots on the layered branch where it is placed in the soil. When these have formed in sufficient quantity for the entire support of the layer, it may be severed from the parent, and removed at the proper season for transplanting, which is from May till August, according to circumstances. Various modes of layering are adopted, the principal being as follows:—Simple bending in the earth; twisting; incision by splitting, tongueing, or heeling; strangulation, or wiring; ringing or piercing; serpentine arching; insertion

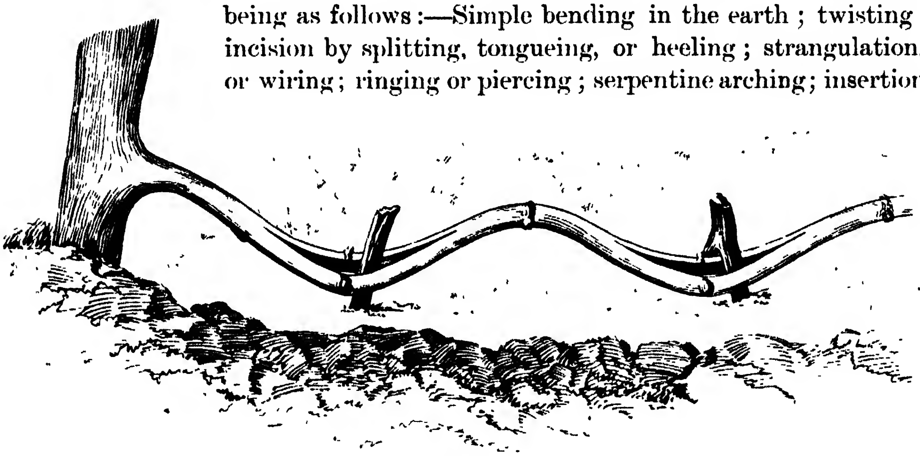


Fig. 1.

of the growing point: and circumposition; and when the principles upon which these are founded are understood, the modes of operation can be varied still more:—

1. Simply bending the branch in the earth and covering. This is usually unsuccessful, as there are only a few varieties which will take root in this manner.
2. Incision by splitting. Select branches which will bend easily, and remove the leaves where they are going to come in contact with the soil, thrusting a sharp-pointed knife through the middle of the branch at the continued part which is to be laid in the earth, and then split it longitudinally to the extent of 2 inches or so, more or less, according to the size of the branch. The parts are kept separate by a piece of wood or stone. The split, of course, occasions an obstruction of the sap, and allows of the emission of roots by the edge of the cleft. (See Fig. 1.)
3. Twisting is performed by twisting the branch and then covering with soil. This operation is to check the returning sap, and consequently favour the emission of roots.

4. Tongueing or heeling is performed by entering the knife about the lowest part of the bend below a bud, and cutting upwards about 1 inch or 2, the branch being then planted at the proper depth. A stone or piece of wood is placed in a groove made for its reception, and the whole kept from springing out of the ground by a hooked peg. In placing it, care must be taken to keep the divided portion separate, for, if in contact, they would unite, and the object of making the cleft would be defeated. It is also necessary to observe that all buds on the layer below the surface, except the bud at the base of the tongue, should be rubbed off or cut out before the shoot is laid down. It will be seen that the sap can ascend by the upper side into the buds left above the surface; but when these expand into shoots or leaves, and when the latter are able to return elaborated sap, a portion returns to the stem, whilst another portion will go towards the tongue, and accumulating there, must break out in the shape of roots. The topmost bud of the shoot will have the flow of sap more direct, because the vessels on that side are entire; but it will also find its way to the buds remaining uncut. The sap from the leaves produced by the latter will, however, tend to return to the tongue, in consequence of that part being on the same side and in connection with the part from which roots proceed. Spongioles should be encouraged with a compost of sand, leaf mould, and loam of equal parts, well mixed, and put all over the part that is laid in the ground. The reason for cutting below the bud is that when a shoot is cut a little above a joint or bud, the dividing parts are apt to die up to the next joint, and it has also a tendency to injure the core of the branch, and if this happens the layer will die. The tongue is sometimes made on the upper side, and the branch is twisted so that the tongue may be placed

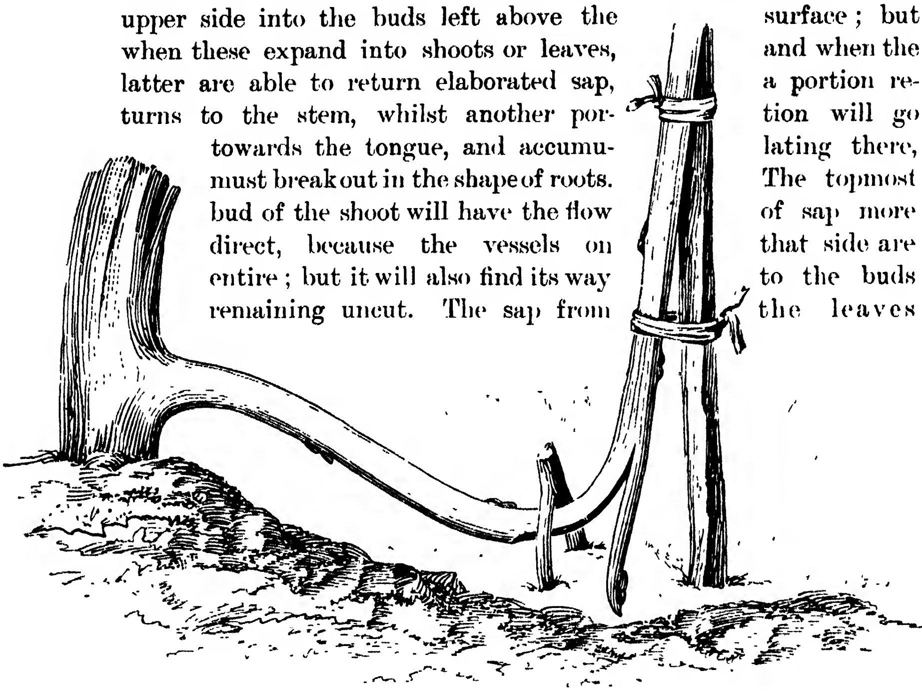


Fig. 2.

in a perpendicular position, and in a downward direction; but, in general, it is preferable to make an incision on the under side, unless the shoot is of a brittle nature, and may bend when cut on the upper side with less danger of breaking. Tongueing is certainly the best way of layering. (See Fig. 2.)

5. Strangulation or wiring.—If a wire is twisted tightly round a branch, the ascending sap will flow along the vessels of the alburnum or cambium layer, but the returning sap, descending by the inner bark, will be checked. Woody layers continue to be formed so long as the outside bark admits of being compressed, but by degrees the portion of it within the ring becomes hard and so compact as to prevent the return of the sap below the ring, and, of course, the further deposition of woody layers. An accumulation of the returning sap then takes place above the wires. Exposed to the drying influence of the air, roots do not readily break out in consequence of this accumulation, but an increased deposition of woody matter is indicated by the swelling of the branch to a much greater thickness immediately above the wire than below it. When, however, the part around which the wire is twisted is laid in the earth, the accumulated sap tends to form roots, and to encourage their breaking out, the part above the ring is sometimes pricked with a sharp instrument in various places quite through the inner bark.

6. Circumposition is an old term for a mode of propagation employed in cases where the branch is far up from the ground, or when from stiffness, brittleness, or other circumstances it cannot be bent down. Whilst the branch, for any of these reasons, retains its position, some soil or compost is arranged around it in a box, garden pot, basket, or any other article, adapted so that the branch can be introduced into the interior. A garden pot may be used to greater advantage when cut down the middle, and a piece taken out of the bottom large enough to allow the branch to be introduced into the pot. The pieces, of course, require to be bound or hooped together. It, however, is preferable to arrange a post or stake with a board on top, thus forming a table or stand for the pot to rest on. The branch can then be introduced into the pot at the proper height, and placed in a suitable position. A slit must be made about 2 inches up the centre of the stem with a sharp knife or saw, and a piece of wood placed in the slit to keep it open. Owing to being raised in the air, the soil in the pot or box is apt to dry rapidly, and this should be prevented by mulching or with moss, which should be kept moist. It will also prove advantageous to cover the whole pot with moss, in order to prevent evaporation. Pots or boxes made of slate, not being porous like those of earthenware, are preferable for this mode of propagation. (See Fig. 3.)

7. Ringing a portion of the branch.—The ring should be taken off quite through the liber or inner bark, otherwise the returning sap would pass by it to the stem, and thus the object of ringing, to interrupt it, would be defeated. Ringing is preferable to strangulation or wiring, inasmuch as the granulated cellular matter has a clean-cut edge to issue from, and on which it can sooner accumulate in sufficient quantity to form protrusions, in the shape of spongioles, than it can burst out. Besides, previous to its doing so, part of it is appropriated for the deposition of woody layers.

Fig. 8. -Circumposition (*Yucca alifolia variegata*).

8. Piercing.—The branch, where laid in the ground, is sometimes pierced or punctured. The returning sap is thereby obstructed, and the emission of roots encouraged. But punctures are more apt to cause disease than clean cuts; therefore, very small circular notches will answer the purpose better, except when the branch is of a tender succulent nature, and liable to bleed when cut.

9. Serpentine layering. This mode is very applicable to vines, such as wistarias, clematis, and other plants which make long running shoots. The shoot is layered at every 2 feet, or less, according to the nature of the plant, its pliability, and the situation of the buds. Each curve below ground is held down by pegs. The buds must be cut or rubbed off. The extremity is supported by a stick, and when the shoot is sufficiently rooted at the different parts laid, it is cut off the parent; then each is cut separately, and planted where

wanted. When this method of propagation is adopted in summer with a growing shoot, the latter must be layered as it proceeds in growth, and the leaves on the part above ground should be preserved and encouraged; consequently, the shoot will have to be shallow, and the curves to be but slight. Sometimes, pressing the shoot at its joint the depth of its thickness in the soil, and

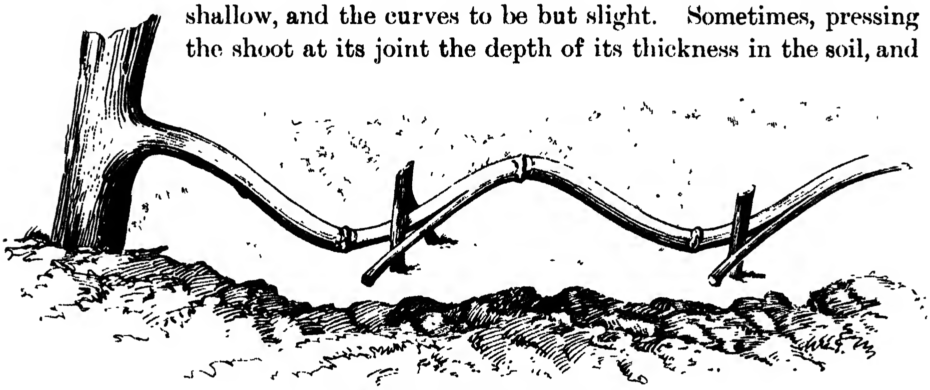


Fig. 4.—Serpentine Layering.

then laying small stones upon it, will be sufficient; but as the stones may be knocked off, small pegs are preferable at any time. (See Fig. 4.)

10. Layering by insertion of the growing point.—Some plants which emit few roots, and these but slowly, by the previously-detailed modes, will produce them in surprising abundance by merely inserting the growing points or tips of the shoots in well prepared

Fig. 5.—Layering by Insertion of the Growing Point.

soil, and before autumn a large bundle of roots will be formed with a bud, which must be carefully preserved in transplanting, and afterwards trained to form a stem. This mode, though not, in general, essential for propagation, deserves notice, as it can easily be tried, and doubtless will often be found successful, in the case of many plants difficult to propagate by other means. (See Fig. 5.)

Construction of Pig-sty Buildings.

[Continued from November, 1907, page 862.]

A. BROOKS,
Foreman of Works, Hawkesbury Agricultural College.

Separate Sties.

A VERY ordinary design of shed to house a number of pigs together is that shown at Fig. 17, built of bush timber—round stuff for the framework, slabs fixed upright for the walls, similar slabs laid down for the floor, and bark roof. The size of the one shown is 16 ft. x 9 ft., and it cost here for labour and materials, £9.

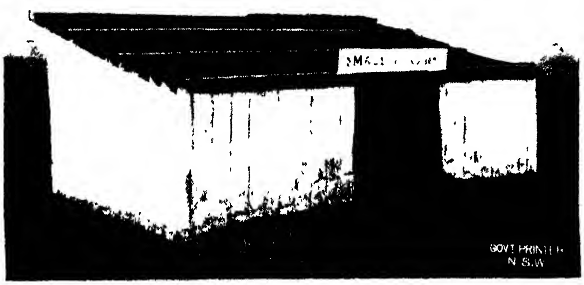


Fig. 17

Such a building may make a decent shelter shed, but it is not by any means a healthy pig-house. The floor allows all the urine to soak through, the walls and roof are a harbour for vermin, and the timbers soon decay away.

Something Better.

Figs. 18 and 19 show the ground plan and elevation of a house of similar dimensions, set into the dividing fence of two separate runs, and so fitted with gates on the front at A-B, Fig. 18, that the pigs can be shut off from either run.

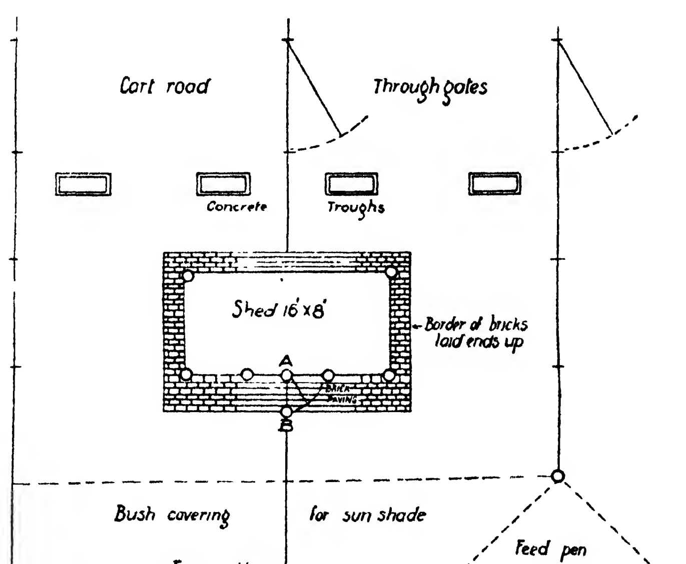


Fig. 18.

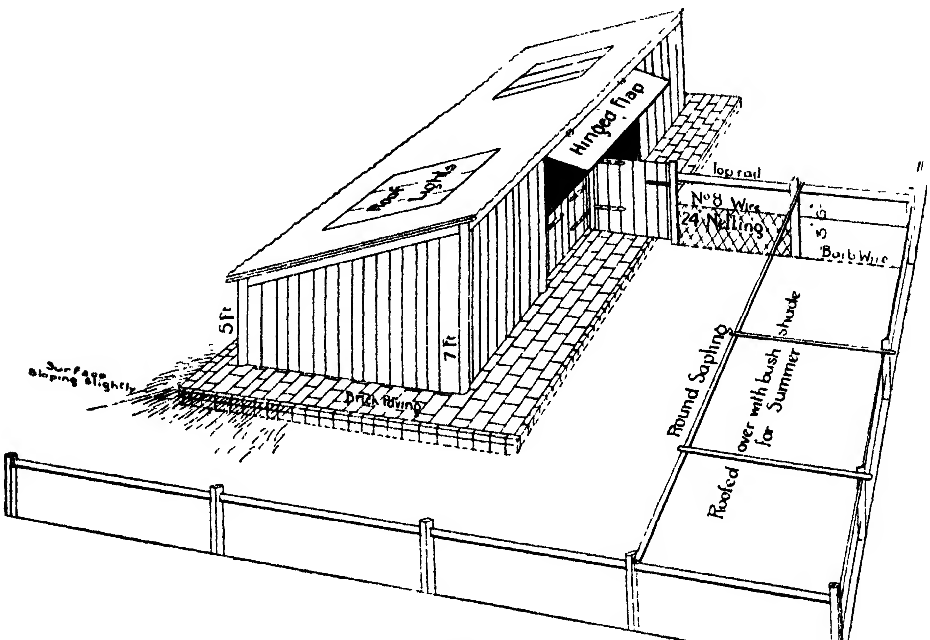


Fig. 19.

The cost of this house is, comparatively speaking, little more than that of the slab one, but it is a sanitary and healthy house in every way, and will last many years. The framework consists of light round posts, with rails of sawn stuff, braced with battens where required, (four) rafters on the roof, with battens 1½ inch thick to take the iron. Both walls and roof are covered with corrugated iron. The wall iron may be set into the floors (see page 860, 1907), thus keeping the faces free from any ledges to hold dirt, and making both walls and floor all the more easy to clean. Should it be desired to have a bottom rail in the walls to fix the iron to, let it be on the outside face, and a few inches off the floor, so that the rain will not rot the wood, and the inside will be free to clean down.

The roof-lights may be thought too elaborate for a pig-sty, but sunlight is most necessary, and in no way can it be better provided for than through the roof. Protection from hailstones can easily be provided for by wire-netting. They may be on hinges, to allow of them being opened for ventilation in summer. They are made in the corrugated sheet of iron ready for fixing, which is no more trouble to do than fixing another sheet, and can be had any length, as ordered. They cost—say, in 9-foot sheets—opening lights, 23s.; fixed lights, 19s., including glass.

The floor, as shown, is of brick paving, laid flat on the sand, requiring thirty-two bricks per square yard, the outer edge bricks being set on their ends to make the border stronger. The joints of the bricks when laid are kept ¼ inch open, and after the floor is thus paved, a liquid cement-mortar grout is made and poured into all the joints until they are quite full and

flush on the surface. To make this grout, mix three parts sand to one part cement into ordinary mortar, then in a half bucket of water mix sufficient mortar to make the grout just thin enough to run into the joints. Previous to pouring in the cement grout, throw a few buckets of water over the floor to wet all the bricks, to prevent them from absorbing the moisture out of the grout too quickly. The floor must, of course, be graded to the back to an open gutter, to carry off all drainage. On this brick floor, portable batten floors, as previously described on page 861 (1907), may be laid in sections to make them easier to handle.

Fencing.

The fencing of the runs may be of posts, with top rail, 34 inches high (for sows), a barb wire on the ground, a No. 8 wire 24 inches up, and 24 in. x 4 in. mesh, and 14-gauge wire-netting threaded on the wires and stapled to the posts. The cost of this fencing (for material only) would be about 13s. per chain. On the front line, sun-shade and feed-pens may be constructed with a few saplings and bushes. Houses and runs thus arranged, the pigs can have the whole of the house room, while only one of the runs is being used; the other may be sweetening up for a few weeks.

A Portable House.

Where it is desired to use pigs to feed off crops and improve the land, shelter is very necessary, and nothing better can be on hand for this purpose than a portable house.

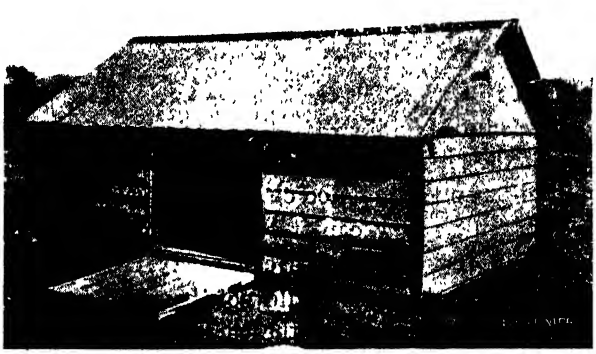


Fig. 20. Portable pig-house.

Fig. 20 shows one 12 ft. x 8 ft., built lightly, but strongly, of sawn timber frame, on 8 in. x 3 in. hardwood sleepers as slides, and boarded on the sides and ends with pine weatherboards, and on the roof with ½-inch match boarding. A drop flap-door on the front provides a gangway for the pigs to walk into the house on, and fasten them in if required. The floor is of battens ⅜ inch apart to allow the drainage to soak through. Drag chains

at either end to hook a swingle-bar to, and one horse can shift it anywhere. It costs about £9 to make, complete. To preserve it in good order, it must, say once a year, be painted externally, and not allowed to stand too long in one position.

Troughs.

Feeding pigs with slop food is most easily done in troughs, and, undoubtedly, these should be well made. They should be so strong that the pigs cannot break them up, but not so cumbersome and heavy that one man cannot lift them about to clean out occasionally. Smaller separate troughs, in a yard where there are a number of pigs to be fed, are preferable to one large trough, where the pigs crowd and jostle each other for the feed. Sometimes a large platform, with a deep gutter all round, is laid down, the feed tumbled into the gutters, and the pigs haul it out on to the platform to feed. This style is very suitable where a large number have to be fed at one time.

The ordinary trough for the sty may be made of various materials, but, like the floors, they should be impervious and easily cleaned. Square and sharp corners should be avoided, and if this is attended to the pig will clean out its own trough.

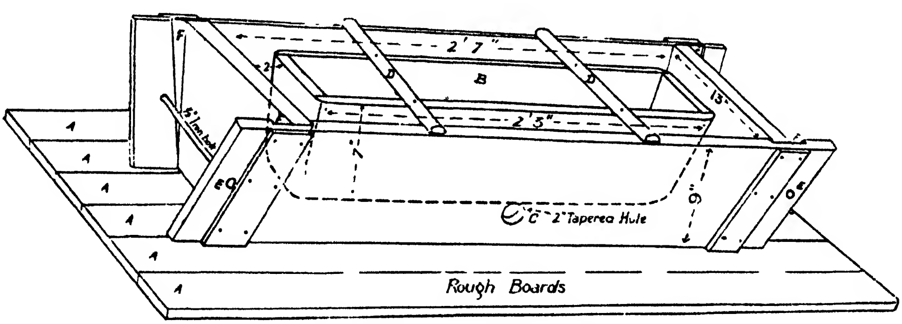


Fig. 21.—Mould for casting Concrete Troughs.

Concrete, composed of bricks, stone, gravel, or such like, broken up to a ¾-inch gauge, mixed with cement mortar, makes capital troughs. All that is necessary is to have a mould—such as is shown at Fig. 21—the stone, sand, cement and water, and a handy man can make a trough at any time he may have a spare hour at a cost of 1s. 6d.

If coarse, clean sand, mixed with about one-third its bulk of finer sand, and using three parts of this to one part Portland cement, no stone will be necessary.

AA, at Fig. 21, shows a rough platform (which would not be necessary if a floor was available) to set the mould on. This mould is made of 1¼-inch pine sides and ends, the latter set into the sides in wedge-shaped grooves, as at FF, and held together by ½-inch bolts and nuts at E. A wedge is inserted behind the end pieces at F to keep them in position and to enable the mould to be more easily taken to pieces when the cement is set.

The centre part of the mould B, with the bearers DD, is made exactly the shape of the inside of the trough, and 2 inches less every way than the outer mould. All corners are rounded off. On the front of the mould a 2-inch hole is made, into which a plug is set, touching against the inner mould, thus providing a cleaning hole in the concrete trough. To ensure a smooth face when cast, the moulds should be lined with light galvanized iron. When making these troughs, fix the outer mould together, set it on the floor on a piece of flat iron, and fill in about 2½ inches thick of concrete; then set the inner mould and press it down until the bearers DD rest on the top edges, and an equal space of 2 inches all round. Set the plug in the front, and fill the concrete carefully in all round, packing it tightly and flush to the top.

Allow this to set for about twenty-four hours, when the plug may be taken out, the inner mould removed, the bolts and wedges withdrawn, and the trough laid aside to dry. Any rough edges should be dressed up before leaving it, and it should be covered over with a wet bag for a few days, when it will be ready for use.

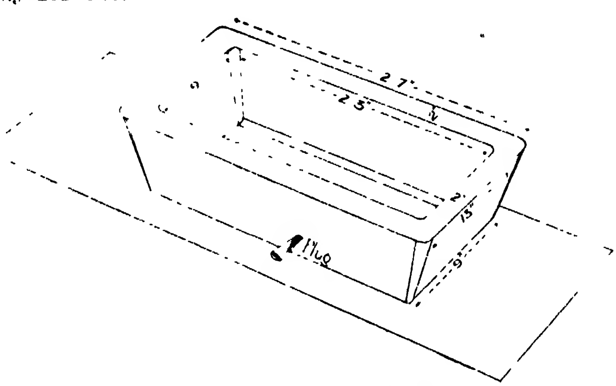


Fig. 22.- Concrete Troughs.

Fig. 22 shows the trough as made.

Another handy trough for suckers can be made of sawn timber, as shown at Fig. 23—the ends 12 inches long, 6 in. x 2 in. thick hardwood, and the

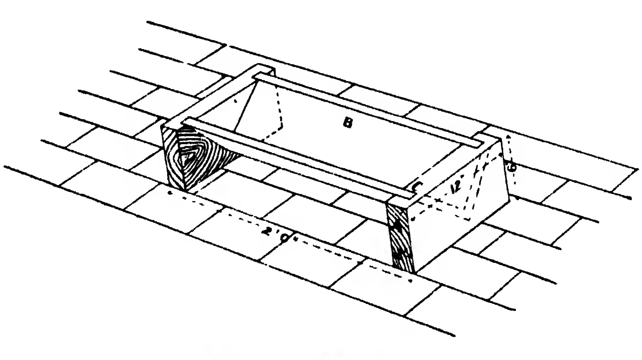


Fig. 23.—Suckers' Trough.

sides of 1-inch pine, jointed and nailed together on the bottom edges, and let into the ends ¾ inch deep, painted and nailed. Use paint on all the joints, and paint the outside when finished.

The Oil-drum Trough.

As a handy, easily made, sanitary trough, to set in the front of a sow's sty, nothing can be compared to that shown on Figs. 24, 25, 26, and 27.

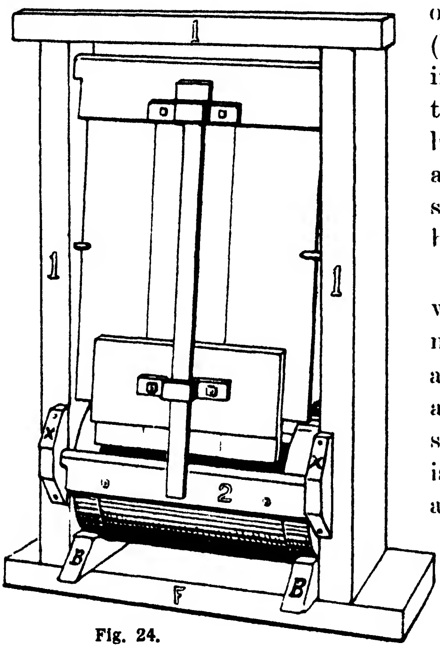


Fig. 24.

To make it all that is necessary is an ordinary 5-gallon linseed-oil drum (larger if you wish it), two pieces of 3 in. x 1 in. hardwood battens to fix to the sides, two pieces of 3 in. x 2 in. hardwood for bearers, cut out as at B, and two brackets of 3 in. x 1 in., as shown at XX, seven (7) 1½ in. x ¼ in. bolts and nuts, and four 2½ in. screws.

Call the top side of the drum that with the bung-hole nearest the rim, and mark out lines on each side 2½ inches above the centre of its depth. Cut with a sharp chisel along these lines on the sides and up to each rim, and the trough is opened up. Shape the battens to fit against the sides of the drum, the front one projecting 1 inch past the rim at each end. Cut and round these projecting ends to form a 1-inch round pin, to fit into the holes in the brackets XX.

When bolting these battens on, take care to have the end bolts pass through the rim of the drum. The inside batten is cut square at the ends, and just long enough to fit in between, and fixed with three bolts. Bevel off all edges of the battens, so that they will not hold anything when the trough is being cleaned out.

The bearers are ¾ inch thick in the centre, so that the trough is that much clear of the floor to allow free flow of the drainage. The swinging flap over the trough shuts the pigs off when cleaning or filling, and is held in position by the sliding bar shown in the centre, and stop pins are at 11 (Fig. 24). It is simply a ledged shutter with round pins formed on the ends of the top ledge, in much the same way as the batten on the trough already described.

The illustrations show the construction very plainly.

Fig. 24 shows the outside or front of the trough, as when the pig is feeding, while Fig. 25 shows the inside.

It will be seen there are no ledges on the inside face; also, note the drop catch or stop, *a*, hanging at the left hand end of the trough. This pre-

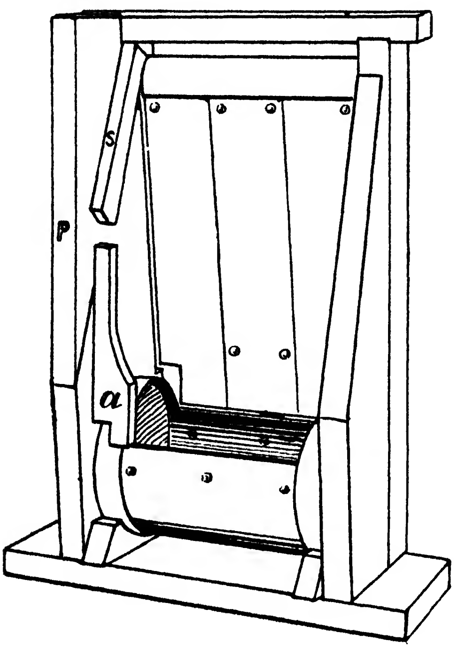


Fig. 25.

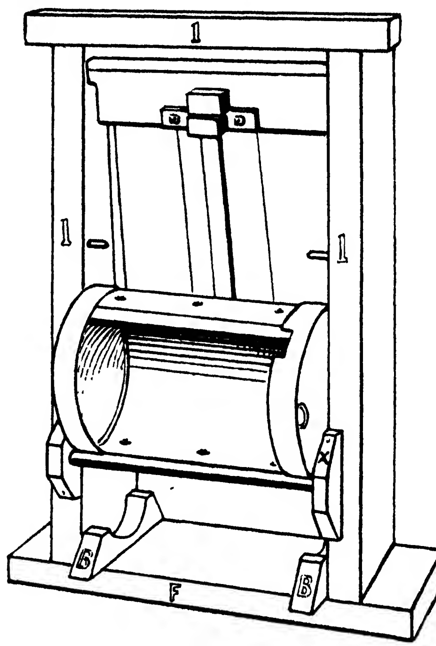


Fig. 26.

vents the pig raising the trough with her snout. The stop is raised by the flap when it is pushed from the outside.

Fig. 26 shows the trough as tilted up, when washing out, emptying into the open drain in front;

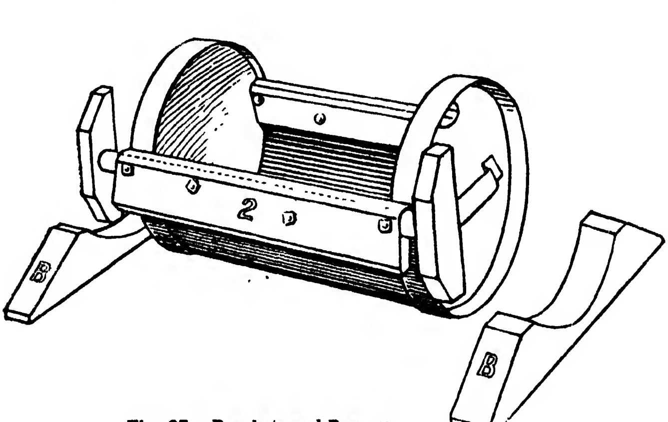


Fig. 27.—Brackets and Bearers.

and Fig. 27 shows the drum, brackets, battens, and bearers, all ready to fix. The cost of such a trough, as shown here at Fig. 27, will not exceed 2s., and they are as clean as a plate.

The Titanic Asbestos Silo.

F. G. CHOMLEY.

THE United States of America is undoubtedly the home of the modern silo: there the wooden tub silo holds sway; but there they are fortunate in having a supply of timber suitable for this purpose, while our hardwoods are not well adapted for staves for a tub silo.

Concrete and ferro-concrete (concrete strengthened with iron rods or lathing) are also becoming common, and where the materials are obtainable at a fair rate, this form of silo is as nearly perfect as anything yet introduced, being practically indestructible.

These materials are not available here at a price that enables the average farmer to make use of them for silo building, except in special cases. Moreover, ferro-concrete requires very careful workmanship, unless the walls are very thick; it would be without the scope of an ordinary farmer to make use of his own labour or that of his employees.

Our native hardwoods enjoy a reputation for durability under circumstances that would cause speedy decay in most of the soft imported timbers, which makes them of great value for framework for silos of which the walls are formed of some kind of sheeting, to make an air-tight silo.

In Victoria a form of silo consisting of an outer framework of circular shape, built of hardwood lined with flat iron, is largely used, but has not been an unqualified success, except that any sort of a silo is a tremendous advance over no silo at all.

During the last year or so there has been introduced to these States a form of cement sheeting that is admirably suited to lining a wooden frame for silo construction, and was first referred to in this journal in October, 1906, by Mr. E. G. Stone, C.E., who designed and erected the first one on his property at Werrington, near St. Mary's. These sheets are mainly a mixture of cement and asbestos; they are strong, durable, fire and acid proof, are splendid non-conductors of heat, and are of large size.

A silo built of hardwood framing and cement sheets has the advantage of simplicity of construction, and is free from the disadvantages the iron sheets are subject to.

Silage made in an air-tight silo of non-conducting material is of uniform quality right up to the edge. This is not the case with iron-sheeted silos, as the following extract taken from an article dealing with Mr. A. Foster's Boisadale Estate, Gippsland, Victoria, published in the *Australasian*, 9th November, 1907, will show:—

Latterly Mr. Foster has been following the system of construction advocated by the Department of Agriculture, and most of the large cylindrical tubs are of iron. But he

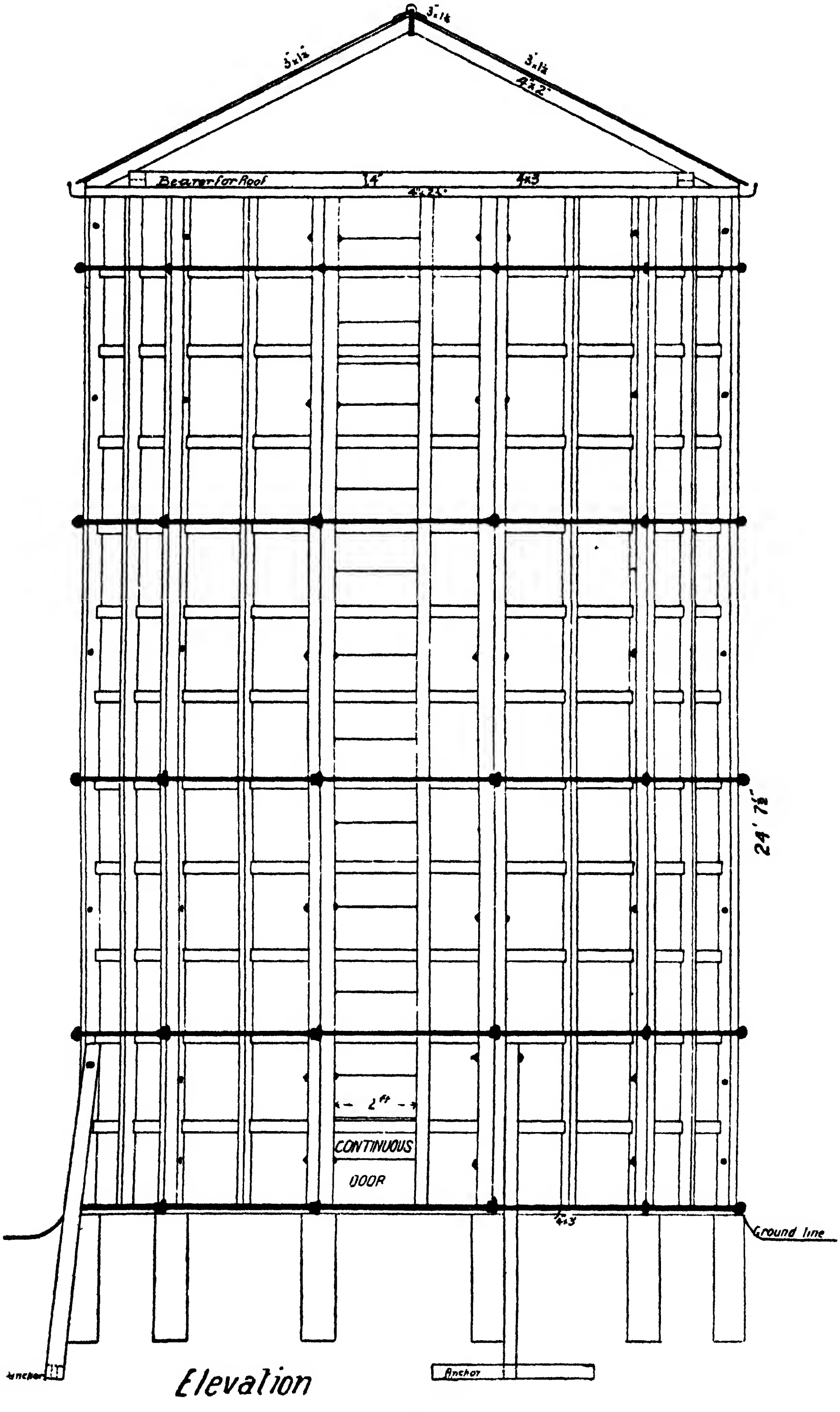

3"x1¼"
3"x1¼"
3"x1¼"
4"x2"
Bearer for Roof
14'
4x3
4"x2½"
24' 7½"
2 ft
CONTINUOUS
DOOR
4x3
Ground line
Anchor
Anchor
Elevation

Fig 1

has not fouud it wholly satisfactory. The great point in favour of the iron silos is, of course, the cheapness of building. If, however, effectiveness is sacrificed for cheapness, it is a doubtful economy. And that appears to be the danger. The best results have not been obtained from the iron structures, but from a wooden silo, which was about the first one erected in the State. Almost invariably, so Mr. Foster states, there is a waste of 3 or 4 inches round the edge, and no explanation can be given of the cause, and no remedy suggested. Whether it is the effect of alternating heat and cold upon the thin walls, or some corrosive effect produced by chemical action of the fermenting mass and the iron, he is at a loss to determine. Unless the fault can be rectified, he intends to build of wood in future.

In the Titanic Asbestos silo which is being placed on the market by Messrs. Noyes Brothers (Sydney), Limited, 109, Pitt-street, and fully illustrated in this issue, the circular form of the standard 100-ton (24 ft. x 16 ft.) wood tub silo has been kept to as nearly as the dimensions of the Titanic sheets would allow, the height being 24 ft. 7½ in. by an approximate diameter of 15 ft. 6 in., which is arrived at by having twelve sides each 4 feet; this gives a content of 4,403 cubic feet, with a capacity of 94 tons of ensilage, allowing 48 lb. to the cubic foot, which is a fair average weight per foot for a deep silo. The Titanic asbestos silo can be made any size the sheeting will work in with, but the stock size is the one illustrated. This size has the advantage of depth, which is very important, while the area is not excessive. The 100-ton silo is the most popular size in the United States for dairymen.

The sheets are 8 ft. 2½ in. x 4 ft. A silo can be made of any number of sides and height, but it is better to have them fairly high, to obtain better solidification of the chaffed fodder. If a silo is desired having a different number of sides to the one illustrated, it would be necessary to cut the studs from the 6 in. x 4 in. stuff at an angle to suit.

Referring to Fig. 1, the silo is seen in elevation. The doorway, it will be observed, is a continuous one; this form of doorway is the kind absolutely insisted on in all tub silos in the United States, and has many advantages.

In Fig. 2 a single section is shown in elevation. In this the method of fitting the battens to the studs is shown, and the distances at which they are spaced to suit the size of the sheets are set out. It should be observed that the sections are absolutely independent of each other, but are built exactly the same in every way, except the doorway section, which is shown in the same illustration. These sections are accurately fitted at the works to the dimensions shown, and when erected in position, as shown by the ground plan, Fig. 3, form what is practically large staves of a tub; these sections are bolted together at the corners, as shown in Fig. 1, and are in addition bound together, just as a cask is, by means of iron rods of special design. These rods, together with the bevelled studs, are the distinctive feature of this form of construction, and are clearly shown in position in Fig. 4.

In Fig. 5 it is shown how two studs having the required bevel are cut from one 6 in. x 4 in. piece of hardwood. The angle of the bevel varies

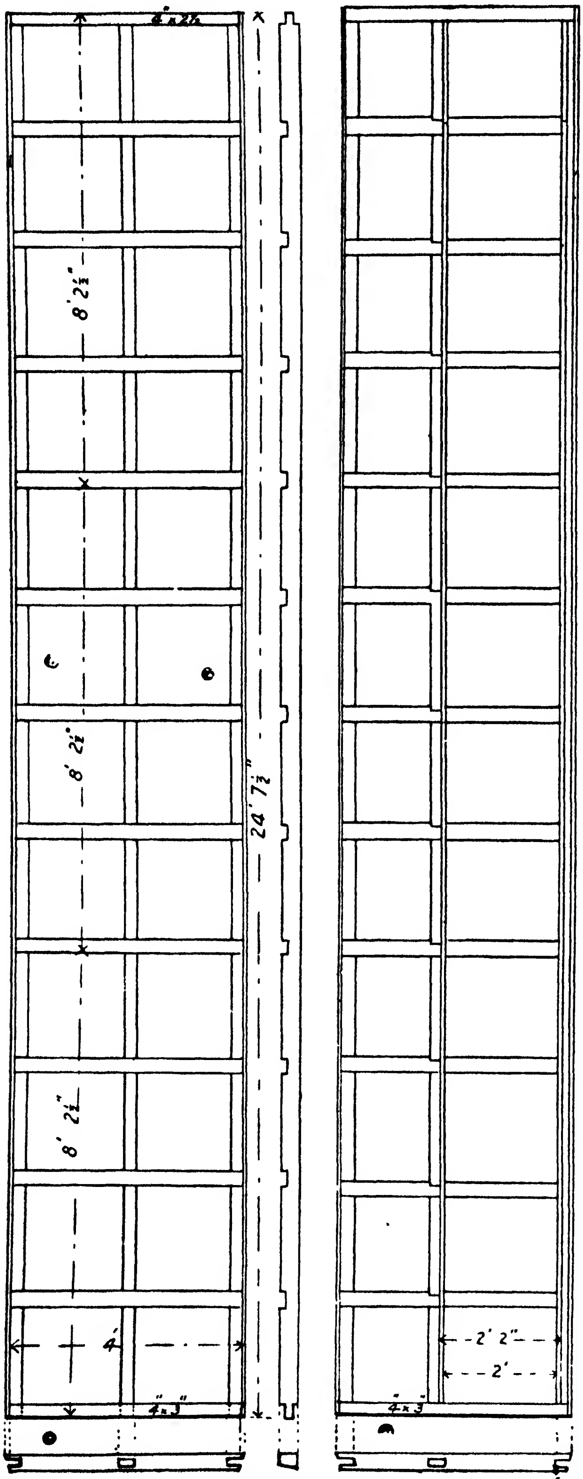


Fig. 2.

with the number of sides. With an eight-sided silo it would be 112½ degrees; ten sides, 108 degrees; twelve sides, 105 degrees; sixteen sides, 101 degrees 15 minutes.

The importance of having the framework bound with iron tie-rods is very great, not only to resist the internal pressure of the ensilage while being made, but in a greater degree to keep the hardwood studs from warping or twisting away from one another at the joints under the influence of the weather. From the nature of the design, any tendency to deviate from the straight in an inward direction would only cause a tighter and better joint, but when the grain of the studs would cause an outward bend this is resisted by the iron tie-rods, and thus a perfect joint is maintained. With the iron tie-rods and the take-up nuts at each joint, a perfectly rigid and cask-like structure is obtained. The iron rods also stay the intermediate studs, and make the whole frame as rigid as the best class of wooden tub silo.

The method of attaching these rods is shown in Fig. 1, and also in detail in Fig. 6. The rods are of ⅝-inch mild steel, shaped as shown, with an eye to go over the end of the next preceding rod, and provided with a thread and nut to enable the rod to be tightened at each joint.

To doubly secure an air-tight joint at the corners and obviate any ingress of air due to the rough surfaces of the studs, which might allow

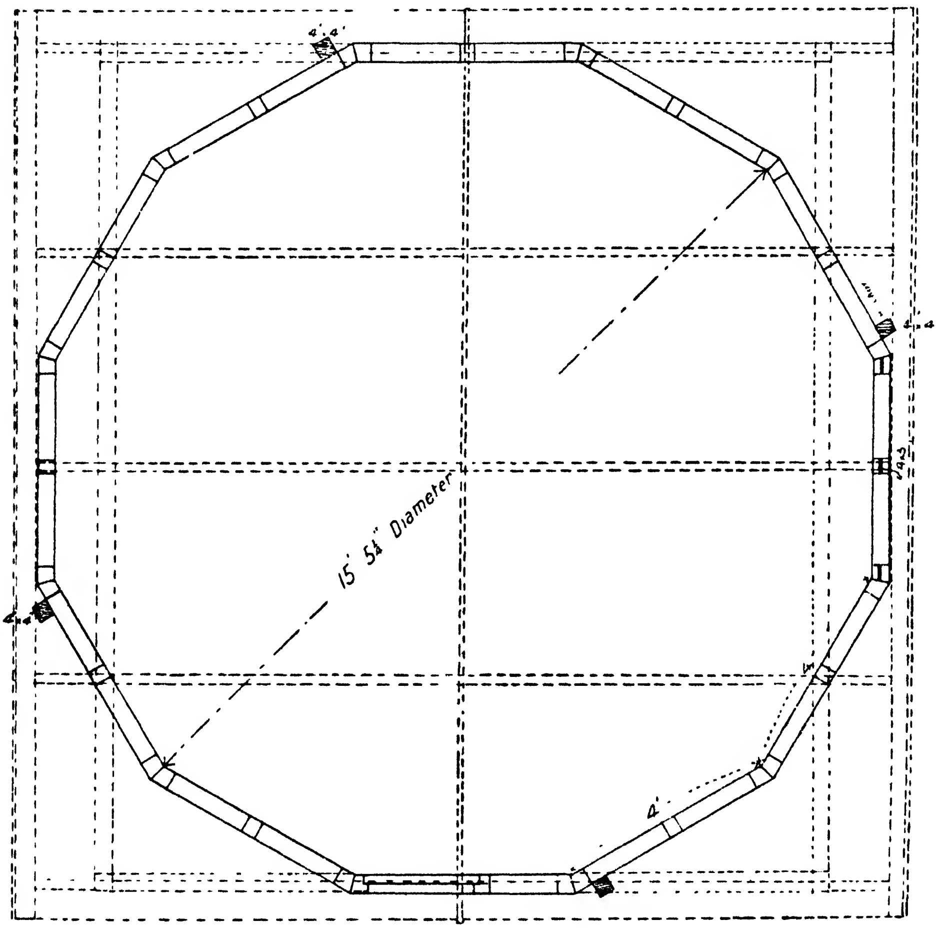


Fig. 3.

slight leakage, a strip of damp-course material is tacked up the studs, as shown in the detail of the corner joint in Fig. 4.

The doorway is of the continuous pattern, which is absolutely insisted on in the tub silo so popular in the United States, as shown on plan in Fig. 7. The studs are rabbeted, as shown, to permit the horizontal planks shown in section in Fig. 8 to be placed against the back of the rabbet and

maintained in position by the ensilage. These boards are placed in position as filling proceeds, and are removed as emptying takes place; there can be no accumulation of carbonic acid gas to cause accident to the men when filling or emptying. Also, when emptying, the boards are removed to the level, or just below the surface, and thus any lifting of the ensilage is obviated. The door-plank is of the dimensions shown, and cut from tongued and grooved Oregon, 26 in. long, 12 in. wide, and 1½ in. thick, with a good stout tongue.

Fig. 9 shows the plan of the bottom plate. This is of 4 in. x 3 in. hardwood, shaped and mortised as shown; the bevel corresponds with the bevel on the stud; the top plate is the same, except that the stuff is 4 in. x 2½ in.

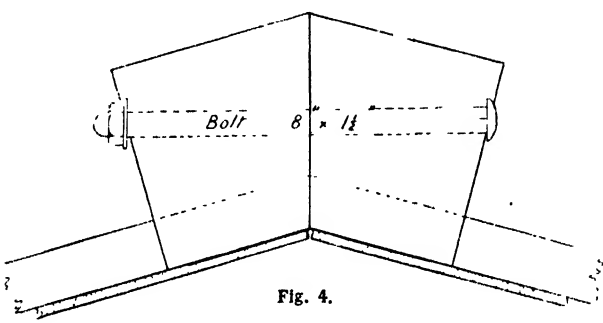


Fig. 4.

To facilitate the setting out of the stumps to carry the frame, a trammel is provided. This is of the shape and dimensions shown in Fig. 10.

In erecting the silo, the foundation stumps are first set in position and accurately marked, as shown in the illustration—only a portion of the stumps is shown—these marks indicate the position the bottom plates will occupy. The sections having all been fitted and securely nailed, as shown in Fig. 2, are placed in position, starting with the doorway section, which is placed vertically on the stumps and carefully plumbed and stayed (the roof battens may be used for this purpose). Care should be taken not to twist or rack the sections while being elevated. When the doorway section is up, the bottom plate should be nailed to the stumps; then the section on either side is raised up and bolted, where shown, to top and bottom of the doorway section. Proceed in this way till all are up, care being taken that the studs are flush at the joints When all the sections are up, the remaining bolts are put in, putting in the middle row first all round; tighten bolts a little at a time, till all are home and taut. The iron rods are next put on—a nail in the studs along the line to support the rods while fixing them will help; thread the bolts together, in the direction shown in Fig. 1, that is, with the nuts to the left, otherwise the screwing up of the nuts will be left-handed, and rather trouble-

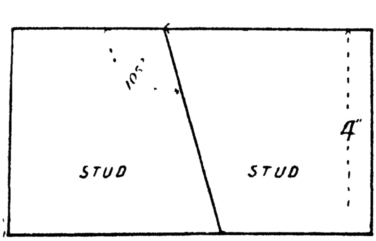


Fig. 5.

some to a right-handed man to work. Screw these gently at first, and go over them twice, or oftener, till all are tightened equally.

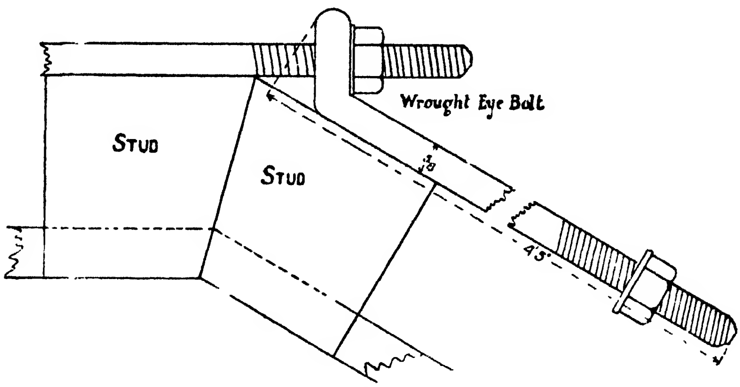


Fig. 6.

The anchor post-holes should now be dug, and the anchors put in and bolted to studs, as shown in the elevation and plan, Figs. 1 and 3. The holes should be thoroughly rammed: the anchors are purely for safety, and may never be called upon to take any strain, but high winds may do some damage when the silo is empty.

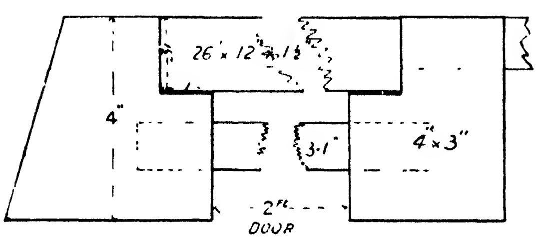


Fig. 7

The roof, which is of the simplest kind, is carried on a roof-plate, shown by dotted lines in the plan, Fig 3, which is bolted or nailed to the top plates.

The framework is now complete, and the sheeting may be put on. The sheets are very tender when first taken from the crates, but soon harden; while green they are slightly flexible, and may be nailed, sawn, or planed.

Fig. 8.

Use 1-inch clout-nails, about 4 inches apart, to attach sheets, but discretion must be used to get the sheets to lie flat against studs and battens. Start at the top of the silo. The sheets should be slid up the studs on edge and nailed. If the sheets do not make a perfect joint at the corners, the edges are to be planed to a fit.

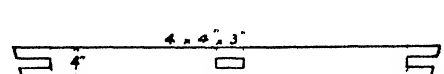


Fig. 9.

A scaffold is not required; use planks across the battens of the sides.

As soon as the sheets are all fixed, the joints may be grouted with a mortar, made of sand and cement, or sand, lime, and cement, of the following proportions:—1 part cement, 1½ part lime, 3 parts sand.

The whole of the Titanic sheeting should now be painted with Ferrol paint, which is provided with the silo.

The practice in the United States is for manufacturers to supply silos ready to erect, with all details worked out and made an accurate fit. The purchaser then knows exactly what his silo is going to cost him: the labour of erecting is usually supplied from among the employees on the farm. The business has become so extensive that every American agricultural paper contains many advertisements of silo manufacturers. When silos are made in numbers, the cost is far less than an individual could possibly purchase the material for and have it transported to his holding, quite apart from the loss of time entailed obtaining the various materials in small quantities and in working out plans and details for himself.

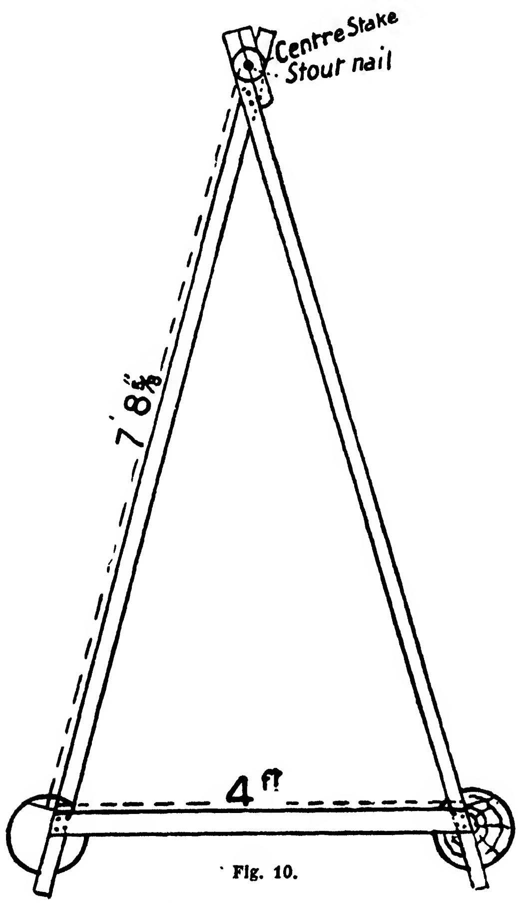


Fig. 10.

Thus it is that a demand for silos has led to their supply at reasonable prices by firms who have gone into the business prepared to supply that demand at a less cost than the farmer can do it for himself. The demand in this State has hitherto not been sufficient to make it worth while manufacturers taking up the business, each farmer being left to work out his own silo as best he could, drawing his supplies from various sources, and paying the retail price for his stuff, and any errors he might make were

all charged to one job. This has deterred many men from going in for silos, who, had they been able to purchase one ready to erect, would not have hesitated. There are circumstances under which it is more profitable to do all the work of sawing the wood, fitting and making the iron-work on the farm—that is, where a saw-bench and a smithy are part of the farm outfit—but for the average farmer who only requires one silo, and who is without any means to cut his own timber, it will undoubtedly pay better to buy the whole thing ready to erect.

To supply this demand, Messrs. Noyes Brothers (Sydney), Limited, are prepared to supply the whole of the material, cut to size and fitted at the works before being sent out, according to their design, or they will supply with the sheeting plans and specification to enable those who are desirous of doing the work themselves.

The price, which is liable to alteration, depending on the market rates for materials, has been fixed as low as possible, and will be quoted on application to them.

Quantities.

The following is a list of the timber and materials required for a silo of the dimensions described :—

Foundation—12 stumps, 9-inch diameter, 2 ft. 6 in. long.
Frame—Hardwood. Studs, 24-25 feet, cut on bevel as per detail, from 6 in. x 4 in. 12-25 feet, 4 in. x 3 in.
Plates—Bottom, 50-feet, 4 in. x 3 in.
Top, 50-feet, 4 in x 2½ in.
Battens 600-feet, 3 in. x 1 in.
Anchor—50-feet, 4 in. x 4 in.
Roof—Bearer, 4–16, 4 in. x 3 in., Oregon.
Rafters, 10–9, 4 in. x 2 in. ,,
Brace, 2–17, 3 in. x 1½ in. ,,
Battens, 8–17, 3 in. x 1¼ in. ,,
Ridge, 1–17, 7 in. x 1¼ in. ,,
7 lengths 4-inch gutter.
3 lengths 14-inch ridge capping.
7 lengths 2½-inch down pipe.
18 sheets 9-feet gal. corrugated iron.
Door—25–2 ft. 2 in. x 12 in. x 1½ in., Oregon, tongued and grooved.
Sheeting—36 Titanic asbestos sheets, 8 ft. 2½ in. x 4 ft.
Miscellaneous—300 feet damp-course, 4½ inches wide.
60 tie-rods, ⅝ in. x 4 ft. 5 in., with hexagonal nut and washer, screwed 3 inches, with ⅝ inch wrought eye, formed as shown in detail of plan.
5 gallons Ferrol paint.
72 6 in. x ½ in. bolts and nuts, with washers.
4 8 in. x ½ in. ,, ,, ,,
8 11 in. x ½ in. ,, ,, ,,
3 lb. screws, galvanized.
3 lb. lead washers.
14 lb. 3 in. x 10 nails.
12 packets 1 in. wire clout nails.
28 lb. cement.

Rabbits and the Western Flora

R. W. PEACOCK.

THE flora of the western pastoral districts of this State is extremely interesting, comprising as it does many trees, shrubs, and smaller plants of peculiar interest to the grazier and botanist. It has been evolved under extreme conditions; only those forms which could withstand severe periodical droughts and extremes of temperature, either as plants or embryos, have survived.

Fig. 1.—Remains of Kurrajong Tree.

The primeval condition of the edible flora, which comprises many trees, shrubs, herbs, and grasses, was very different to what it is to-day. The stocking of this country by man, firstly with cattle and afterwards with sheep, has in many instances (far too many) led to serious deterioration. Stocking with cattle had far less effect in this respect than the overstocking with sheep which has in many places been practised. Since the advent of sheep, another important factor in this deterioration has appeared, viz., the rabbit. The rabbit bears as great a relationship to the sheep in the matter of deterioration as sheep bear to cattle. The effect of the rabbit is extreme and astounding, bringing about a metamorphosis in the flora upon a scale which seemed incredible, and testifies to the marvellous

adaptability of exotic plants during fair to good seasons, as well as the prolificacy of these and native herbs.

These rabbits, appearing in millions, devastated the country first from the south about twenty years ago; their northward march was checked for many years by the wire-netting fence erected along portions of the southern and western railway lines; beyond this barrier the rabbits did

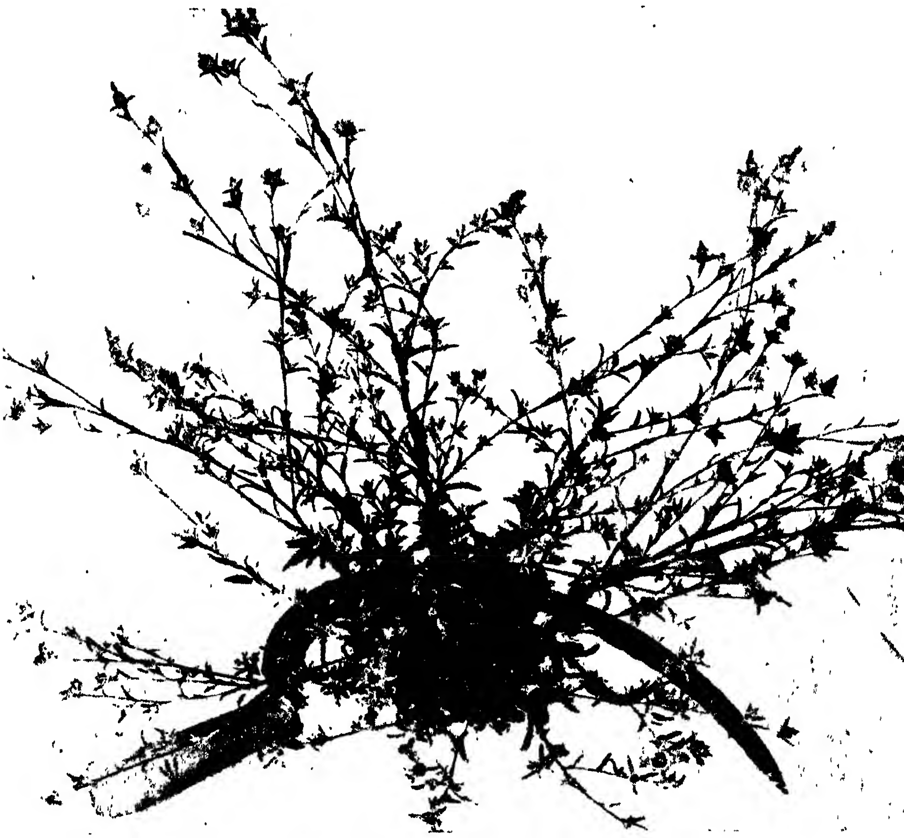


Fig. 2.—Cockspur (*Centaurea solstitialis*)

not appear in plague form until the past few years. It is upon this area that my observations were made. I was in a position to study the flora prior to the rabbit, and to view it after he had worked his sweet will upon it. As regards the edible trees, the position is lamentable, thousands of valuable kurrajongs, leopard trees, orange bushes, wild lemon, and others which had played their part in the sustenance of hundreds of thousands of sheep throughout the 1902 drought and preceding droughty years, had been ringed, and were dying without hope of recovery. The only redeeming feature of this tree-ringing was the fact that the rabbit is partial to budtha; stock, generally speaking, will not eat it, and it is one of the worst trees for the pastoralist to cope with in the improvement of the country. Many of these have been destroyed.

Many small kurrajongs were eaten down, and trees 7 inches in diameter were felled by the rabbits and the leaves, branches, and trunks devoured by the hungry rodents. All that was left of one such tree is shown in illustration, Fig. 1.

The orange bush proved very palatable, and the rabbits would eat all the bark from the trunk, and climb up the bushes and strip the limbs up to fully 10 feet from the ground. The effect of all this wholesale ringing will be seriously felt during the next drought, the edible trees being one of the principal features of large tracts of this country.

Upon the herbage their effects were very marked; not a vestige of the more common herbs and grasses, which the rabbits relished, could be found. In the place of these, a white everlasting (*Helipterum* species) has taken possession of hundreds of thousands of acres. The reason that this has taken such a hold is on account of the rabbits not eating it, although practically starving. This fact was the salvation of the kangaroos and many thousands of sheep. The kangaroos and sheep, also cattle, may not have relished it, but it was Hobson's choice, and they appear to do fairly well upon it whilst young, and when it was more mature and the seed-heads formed sheep appeared to thrive upon it.

The rainfall over this tract for the past two years had considerably exceeded the average.

Further eastward another plant, *Centaurea solstitialis* (Cockspur), has taken possession of large areas. The seeds were introduced in fodder for starving stock throughout the 1902 drought. This plant has adapted itself admirably to the conditions of the past few years. It has come to stay, as I have noticed large patches existing through severe droughts in horse-paddocks around homesteads. Fortunately, sheep thrive upon it, and it is spoken of highly by pastoralists of large experience. Rabbits do not eat it, which accounts for the hold which it has obtained. In proof of this statement, I might mention that I saw an embankment of a tank covered with it to the height of 18 inches, whilst the surrounding country was perfectly bare, excepting for the white everlasting. The embankment was enclosed by a drop-fence, which was sheep-proof, but not proof against rabbits, of which there were thousands surrounding the tank.

The above are striking instances of the effects of rabbits upon the flora, and I have no doubt but that pastoralists and others have noticed other cases applicable to other plants. It will be seen that the effects of the rabbits are not transitory, but may be permanent, and the most deplorable feature is probably the ringing of the edible trees. Other plants seed so profusely, and the vitality of such seeds is so great, that they will probably reinstate themselves after many years. Not so with our edible trees. Under our present system of stocking, many of these have gone for ever. It behoves those interested to weigh this aspect of the case and to use every endeavour to cope with the rabbit, so that this important section of the State will not suffer further deterioration.

Sheep and Saltbushes.

COOLABAH EXPERIMENTAL FARM.

Feeding Experiment.—Second Term.

GEO. L. SUTTON and H. J. KELLY.

This experiment is a continuation of that carried out in 1904-5, the details of which were published in the *Agricultural Gazette,* July, 1906. The experiment, when originally planned, had for one of its objects the determination of the carrying capacity of land planted with saltbush; but, on the expiration of the first period of twelve months during which the experiment was running, it was found that the paddock in which the experiment was

Fig. 1.—The paddock as it appeared when the experiment started.

being conducted had still plenty of saltbush feed in it, though this paddock had carried for the twelve months an average of nearly a sheep and a half per acre. In order, therefore, to obtain the information desired, it was necessary to continue the experiment for a further term, and until the saltbush feed was exhausted.

The second term of the experiment was therefore entered upon, immediately at the conclusion of the first term, 30th November, 1905; and, in addition to testing the carrying capacity of land under "Old Man" saltbush, its object was incidentally to observe the effect of an almost exclusively saltbush diet for a prolonged period upon the wool and stamina of the sheep.

The paddock in which this trial was conducted was the small one of 6½ acres, in which the unpenned sheep, during the first term of the experiment, were running. In 1899 it had been planted with "Old Man" saltbush, in rows 8 feet apart; 4 acres had made very satisfactory growth, as can be seen from the illustration (Fig. 1),which shows this portion of the paddock before the sheep were turned into it at the commencement of the first term of the experiment. On the remaining portion of the paddock the saltbush was very thin, and its growth meagre. On 13th July, 1906, a portion of the paddock, which was almost destitute of saltbush, was ploughed up and fenced off. This reduced the area available to the sheep to 5·69 acres.

It is interesting to note that the soil in this paddock is not the typical black soil usually associated in this district with saltbush, and on which it naturally grows, but is what is known as "Red" country.

The paddock, during the preceding twelve months, had carried six sheep for the first three months, ten sheep for the next four months, and eleven sheep for the remaining five months, or the equivalent of 1·44 sheep per acre for twelve months. Despite this comparatively heavy stocking, there was, at the commencement of this term of the experiment, an abundance of saltbush within reach of the sheep, also a short green shoot, and some dry grass and herbage.

Good rains fell towards the end of February and during March, and, though the paddock was carrying over three sheep per acre, the grass made a fair shoot, which was much relished by the sheep; this green shoot remained in evidence until the middle of May.

Towards the end of July, the lower portions of the saltbush within easy reach of the sheep had all been eaten. At this stage, sufficient of the higher top branches to meet the needs of the sheep were broken down as required. On 11th September the whole of the saltbush was eaten, and it became necessary to remove the sheep and terminate the experiment.

The sheep with which the trial was conducted were the wethers and the ewes and their progeny used during the first term of the experiment. There were four wethers, ten ewes, and six lambs; the ewes and wethers were about 3½ years, and the lambs between 1 and 2 months old. Three ewes (one of the ewes with a lamb) and one wether had been confined in a pen and fed exclusively on saltbush during the previous twelve months, and the remainder had been running loose in the small saltbush paddock, their diet being mainly saltbush, with the slight addition of any grass or herbage which grew after rain.

On 4th April, 1906, a ram was added to the sheep in the paddock, and remained with them until 17th July. The result was that eight out of the ten ewes became in lamb.

The sheep were shorn on 16th August, 1906, exactly twelve months later than the date of the previous shearing. The fleeces, including those of the hoggets, averaged 10½ lb. each.

On 26th August one of the ewes died; a *post mortem* examination showed that she was in lamb, and that her death was probably due to compaction, as the contents of the stomach had formed into a hard, dry lump, this state possibly being largely due to the character of the food she was getting.

During the early part of the experiment, the sheep had free access to water at a tank in a small bare paddock adjoining the one in which they were running; but after the rains in February, which caused a growth of herbage in the tank paddock, the sheep were driven daily to the tank for water, and immediately after watering were returned to the saltbush paddock.

Fig. 2.—The paddock as it appeared at the conclusion of the experiment.

The rainfall recorded during the progress of the experiment was:—

Date.	No. of days on which Rain fell.	Totals.
December, 1905	1	3·20
January, 1906	4	·68
February, ,, ...	5	5·04
March, ,, ...	7	3·91
April, ,, ...	4	·27
May, ,, ...	5	1·31
June, ,, ...	5	1·20
July, ,, ...	1	·03
August, ,, ...	5	2·12
September 10, 1906	2	1·01
		18·77

At the conclusion of the experiment the sheep appeared in good health, and, although not in very good condition, could not be termed poor; four wethers, with one month's growth of wool on them, weighed 370 lb. The

total weight of these same wethers nine months previously, with three and a half months' wool on them, was 469 lb., so that the treatment they received during the course of the experiment was responsible for a total shrinkage, in their case, of about 90 lb.

Mr. T. C. Dickson, of "Yarrawin," who bred the sheep and selected them for the experiment, kindly consented to examine the sheep shortly before its completion. With regard to this experiment, on 24th September, 1906, he wrote as follows:—"I had the sheep in the yard and had a good look at them. They have altered very much since they were taken to the farm, and have also altered since last year; the wool has grown smaller in the fibre, and shows a shorter and weaker staple, without any increase in quality to make up for the loss in weight. They have not grown the frame they would

Fig. 8.—Showing the paddock after twelve months spell.

running on natural pastures. I cannot understand why they have produced such a black yolky tip—quite as good a tip as you see on sheep reared in a cooler climate. I can give no reason why sheep fed on natural grasses and herbage show a white tip inclined to be fuzzy, while these sheep, fed only on saltbush, show a good tip. Although they have not grown a really profitable fleece, nor produced the carcase of more highly-fed sheep, the experiment proves that sheep can be kept alive, on saltbush only, for a considerable time—possibly for long enough to tide over a severe period of dry weather, probably at less cost than by expensive means of artificial feeding. The experiment has also shown that saltbush can be grown at little cost—at a less cost than any other fodder—in a very dry time, and is practically drought resisting. I may state that, although the sheep looked to be in good condition and strong, I do not think they had much vitality of system left, and would not stand the hardship travelling sheep have to go through at times."

This report sums up the results of the experiment clearly, and in a concise, practical manner. Coming from such an experienced and recognised authority on western conditions, it shows conclusively the great value saltbush has for mitigating the effects of the droughts, which periodically visit these dry districts.

That sheep for twenty-one months maintained a healthy condition on a diet consisting almost exclusively of saltbush, and during that time produced fair fleeces and reared lambs, demonstrates that the feeding value of saltbush is very good. Seeing that the small saltbush paddock in which the experiment was conducted carried an average of nearly one and a half sheep per acre for twelve months, and then an average of over three sheep per acre for a further consecutive period of nine months, it is evident that the carrying capacity of conserved saltbush country is very high. From these facts it is plain that the pastoralist, by planting and conserving saltbush, has available a practical method of making provision for times when grass and ordinary herbage is scarce.

Once established, the saltbushes will remain available for many years. The recuperative power of the plant is very great. At the conclusion of the experiment, the saltbushes had the appearance of a number of dead bushes, as may be seen from the illustration (Fig. 2), which shows the paddock just after the sheep were removed. The sheep had nibbled off the young shoots as fast as they appeared, and because of this, it was feared that the bushes might be permanently injured and would not recover their usual vigour. These fears proved groundless, for, twelve months after the sheep had been removed, the bushes had almost as much feed on them as ever, and presented the appearance shown in Fig. 3, which is from a photograph taken some twelve months after the termination of the experiment.

By this experiment, the value of saltbush for our western country has been demonstrated in no uncertain way. In order to make the fullest use of the advantages which this plant possesses, the cheapest and most expeditious method of planting it will have to be sought and found. A suggested cheap (but untried) method, and one which seems likely to be successful, is to sow the seed, on bush-land or on plain country, with a maize-planter or similar implement during a favourable season. Such an implement, drawn by a horse, would open a furrow for the seed, deposit the seed, cover it up, and at the same time compress the seed into the moist earth. The difficulties in the way of sowing the seed effectively, but cheaply, are purely mechanical, and are likely to be readily solved once attention is drawn to this subject. Possibly the now almost ubiquitous poison cart could be adapted, with slight alteration, for the purpose.

For the planting of seed with any machine to be attended with success, it is believed that some provision for compressing the seed into the moist earth as it is planted will be absolutely necessary.

Diseases of Fowls.

[Continued from December, 1907, page 926.]

Chicken-pox or Warts.

G. BRADSHAW.

The above is a blood disease, unknown in England and other temperate climates, is most virulent in South Africa, is prevalent in various parts of the Commonwealth, and particularly around Sydney. Mild cases have been seen in New Zealand, and although of frequent occurrence in the Southern States of America, it is in a simple form, and not regarded with any danger as here, where late hatched chickens succumb to it in thousands annually. In India, South Africa, and America it is known as chicken-pox, and in Australia as warts, affecting chickens only, usually appearing in the autumn, most cases occurring in the month of April. The younger chickens usually succumb to it, while in those of from three months upwards deaths are rare.

It is communicable from one to another, generally going right through a yard, even in birds which the owner thought had escaped. Such might not be the case, as the attack in different subjects is so extreme that one bird's head and eyes may become a mass of eruption, while, in another, if the same brood, the only visible symptoms may be a ruffled appearance of the plumage, and languid gait, but when caught, the subject may be just as feverish as the most severe case. This leads some breeders to think that in a country in which chicken-pox occurs, like the measles in children, every one is expected to take them, and in the latter there are cases so mild that it is not unusual for a parent to say that a child never had the measles, when such may have been in a form unnoticeable. The breeders who contend that warts or chicken-pox attack every chicken in the yard, point to the fact that although understood to attack chickens only, there are instances of adult birds taking it, these exceptions being cases which escaped it in chickenhood, and all evidence points to the disease occurring only once in the same chicken, or in other words, chickens which have had the disease become immune to further attacks, and seldom or ever does it occur more than once in the same individual. A peculiar feature of the ailment is that while adult fowls are rarely affected, birds imported from England to any of the Sydney suburbs usually take it, but not until the season of its appearance among the chicks. That is, fowls arriving in, say, May, June, or July take the disease in the following March or April, the season when it is most rife; indeed it is nothing unusual to see the English birds covered with the eruptions, every other adult in the yards being free, the inference being that the latter had it

during chickenhood, and are thus immune from further attacks. Ill-effects rarely result to adult birds, but many instances occur of chickens, when better of the disease, having during its course acquired roup or other ailment.

The first noticeable symptoms are small pale eruptions or warts appearing about the eyes, head, and nostrils, gradually extending over the comb,

From Bulletin No. 161. Berkeley, California.

Intestines and Mesentery of a Fowl affected with tuberculosis.

(See page 922, December, 1907.)

and eyes, some specimens becoming actually blind, when they have to be hand fed till the eruption or scab ripens and falls off, while sometimes the case is so severe that one or both eyes are totally destroyed.

Mrs. Lance Rawson, the authoress of the "Australian Poultry Book," 1893, then residing in Queensland, told the writer that warts were the most

terrible scourge that Queensland poultry-keepers were subject to. In her work, she says, "I conclude that warts are peculiar to the warmer parts of the colonies, as I have never seen it in the colder parts. It comes like a scaly eruption, generally about the head, eyes, and nostrils, and by degrees the whole head is covered, the chickens frequently going blind, and if not hand fed will die of starvation. It is wonderfully infectious, seeming to be in the air. I once had three chickens affected, and isolated them at once, but in ten days I had thirty in the same state. The disease has baffled and disheartened many poultry men, 20 or 30 per cent. of the chickens frequently being lost."

In America, the disease, when it occurs, is of so mild a form as not to warrant any college experiments, and is dealt with lightly in a book on poultry diseases in that country, as follows: "Chicken-pox is known by the scabby ulcers appearing on any part of the body, but principally on the head and wings. The ulcers exude a liquid, and present themselves in masses, and have no great depth. Together with the eruption the bird shows great thirst, and a rise of temperature."

Lewis Wright, the well-known English authority, says:—"The disease is rare in England, but frequent in hot climates, such as the Cape, Australia, and America. It begins with a whity-brown excrescence near the base of the beak, and extends rapidly, becoming yellowish as it does so. It also invades the head and neck. If the nodules are broken, they exude matter. The complaint is manifestly contagious, and isolation and disinfection are the first measures."

The first symptom is the fever, or incubation stage, and rarely observed. After this the rash or eruptions appear; they then grow and spread, change appearance gradually, ripen, become scabby and dry, and ultimately fall off, but not infrequently, as with children, leaving some ill results. We have yet no knowledge of the extent of the fever stage of the disease. The observant poultry-man will, however, witness a complete change in the droppings of the fowls, the well-known appearance of that from healthy fowls being changed to a soft yellowish matter, at once indicative of ill-health. The eruption then follows, and, although locally termed warts, such name can be only applied to the later stage of the disease when the eruptions become dry and scabby. These at the commencement are small, pink in colour, and of irregular size, and most noticeable on the comb, which increase in size, ultimately running into one another, resulting in a large patch of eruptions, which in the ordinary course would soon dry up and fall off. Rather than this, however, when the ripening stage is reached they become itchy, the fowls scratch the healing spots, the scab is prematurely removed, leaving a raw patch of flesh which is further irritated by mosquitoes, the three or four weeks stage of the disease being thus frequently lengthened into double that time, and often with the loss of one or both eyes. It most often happens that chicken-pox brings other ailments, roup and diarrhœa frequently resulting and contributing to great mortality.

In the whole history of poultry diseases in this country few have received such varied and contradictory treatment as has chicken-pox or warts.

In almost every instance the fact has been overlooked that the disease is one of the blood, and that these eruptions have to go through a stage of growth, terminating in the ripening of the pox, consequently the remedial measures, just as with measles and chicken-pox in human beings, must be those of an internal nature. Together with the many things on the market for this disease, almost every poultry-man has some home remedy, or, as he is pleased to call it a cure. One man told me he cured his birds by rubbing on the sores grease and ashes; another that gunpowder and grease was good; another cured some Leghorns with kerosene, and giving sulphur pills. The fact remains that several of the above admitted that they could not cure the very small chickens, while it is quite possible that those of larger growth which they claimed to have cured would in the absence of any treatment have recovered.

Mrs. Lance Rawson, the Queensland authority, evidently realised this when she says, "I think the disease is a blood disorder, and the only remedy I have found is to mix plenty of sulphur in their food, and give a good deal of boiled vegetables every day." Lewis Wright says the same thing, viz., "That small doses of sulphur should be given internally with tonics and green food, and the spots painted with a 2 per cent. of formalin. When the disease is first noticed an aperient should be given."

I have already said that the disease is experienced in a mild form only in America. That, however, is speaking generally, there being some States where it is severe, as the following extract, contributed to an American newspaper, shows:—

> Of all the poultry diseases the fancier has to contend with, chicken-pox in its malignant form takes the lead. I have been in the poultry business for the past twenty-five years, and it is wonderful to read all the rot and contradictory theories that are written on this subject. Some go so far as to claim it is a local disease, caused from mosquito bites; others claim it is dry roup, &c. While the etiology of chicken-pox is still shrouded in mystery, there is no doubt it is of microbe origin. There are three distinct stages of the disease—the eruptive, that of desiccation, and that of desquamation. It is sometimes discrete (mild form), when the pustules remain separated from each other, confluent (or severe form), when the pustules unite.
>
> This disease is both contagious and infectious. Symptoms: a vesiculo-pustula eruption of the comb, face, and wattles; colour, yellowish white, and becoming pustular as they develop, ending in a dry scab; when these scabs are removed they resemble a bunch of spiles set in the flesh, and breed freely. In the confluent form the eyes are closed, and a yellow fungus growth forms in the corner and under the lids of the eyes. From the pressure of this fungus growth on the eyeball we often find the eyeball ruptured and destroyed. Whenever we have a case of the confluent form we do as George Washington did—we use the hatchet.
>
> As to the treatment, I am a great believer in the old saying: "An ounce of prevention is worth all the cures." This is my treatment—prevention; hence for five years (although my neighbours' poultry has had the disease) I have not had a single case of chicken-pox, or sore head, in my flocks. My mode of prevention is this: thoroughly cleanse everything in the yard, houses, &c., and sprinkle with carbolated water (one teaspoonful of carbolic acid to 1 gallon of water); give for drinking water two tablespoonsful of sulphate of

magnesia (Epsom salts) to 1 gallon of water; place this water (and no other) before your chicks twice a week during the summer months. Use this treatment, and a case of sore head will be a rare occurrence in your yards.

If you have not used this treatment, and should have the disease in your flocks, a remedy we have used successfully is to bathe the head of the fowl in warm water, and apply to all sores a coat of pine tar; do not try to pull off the scab; let them drop off. Many applications have been suggested; but I would advise that in all confluent cases—that is, where the pustules united and form a crust over the face and eyes—I used the hatchet.

The above recommendations for cleanliness in the poultry yards as a preventive of chicken-pox may have been effective in the instance quoted, but if so the disease must be of a different form from that experienced here, where fanciers' yards which have been models of cleanliness have had the disease in the most destructive form. Bathing the head in pine tar or aught else would have no curative effect in many cases here. Outward applications of vaseline, oil, or other greasy material are certainly useful in the way of allaying painfulness of the sores and reducing irritation, but the disease has to go through its various stages, terminating in the scabs dropping off. Consequently we have to fall back on the remedies suggested by Lewis Wright, Mrs. Rawson, and others: small doses of magnesia and sulphur, with strengthening food throughout the period, with an occasional application of oil, vaseline, &c. Should the scabs have become prematurely removed, thus leaving a raw looking sore, one of the best healing ointments can be prepared as follows:—

Powdered oxide of zinc, 80 grains
Glycerine, 1 drachm
Lanolin, 1 drachm
Lard, 6 drachms.

Melt the lard and lanolin together, add the glycerine, and stir in the zinc until the ointment "sets." The most simple and effective way to apply the ointment is with the finger.

Before leaving the subject it should be mentioned that there are some poultry keepers who attribute the disease to mosquitoes. The best answer to the above, at time of writing, is that mosquitoes are as plentiful as they can be, but there is no chicken-pox. There, however, is no doubt that these irritating and disease-carrying insects interfere in delaying largely the course of the chicken-pox disease, though in no way responsible for its outbreak.

(*To be continued.*)

Nutritive and Digestive Properties of Frozen and Chilled Meat.

THE keeping qualities of frozen beef and mutton are sometimes brought into question by the housewife, and some prejudiced persons will not admit that frozen meat of any description is equal to fresh meat. Whatsoever the experience may be of the practical housewife when cooking frozen meat, the report by Dr. Rideal (which has recently been issued in pamphlet form, for and on account of Messrs. Weddel & Co., of London) gives expert evidence as to how frozen and fresh meat compare during the process of cooking, which apparently goes to show that at any rate frozen meat as a food is not inferior to fresh meat.

The following is the report by Samuel Rideal, D.Sc., Lond., F.I.C., Chemical Laboratory, 28, Victoria-street, Westminster, dated 14th February, 1907, on the nutritive value of frozen and chilled Argentine beef and Australian lamb and mutton:—

Some years ago I had an opportunity of ascertaining whether the hard freezing to which a number of samples of Queensland meat had been subjected influenced their digestibility and value as food, and from the results of that inquiry I was satisfied that, both with regard to digestibility and for the preparation of soups or beef tea, the hard-frozen meat from Queensland was of intrinsically the same value as that which had been chilled for a short period, or freshly killed. Since that date Argentina has fostered a trade with this country in beef which is shipped, either chilled for a much longer period (about four weeks), or hard frozen, so that at the present time, in the London market, there are on sale large quantities of frozen and chilled beef from the Argentine Republic.

It is, therefore, of interest to consider whether either of the two methods of preserving beef from the same source modify their dietetic value in any way.

For the experiments, three shins and three portions of steak were employed. The two samples of frozen beef were taken direct from the London and India Dock Co's. Victoria Dock Cold Stores, roughly weighed, and despatched to my laboratory in Westminster.

For further reference, these different samples were lettered as follows, and are designated throughout this report:—

A.—One shin of Argentine chilled beef marked "La Plata Cold Storage Co.," weighing 9½ lb.

This sample arrived in Liverpool on the 29th December in the "Highland Laird," after a voyage of thirty-one days duration, at a temperature of about 29½° Fahr. The meat was railed direct from ship to Smithfield. This beef was from a bullock about 3 to 4 years old, and was of good average quality.

B.—One Argentine frozen shin marked "La Plata Cold Storage Co.," weighing about 8½ lb.

This beef arrived in London by the "Highland Mary" on the 13th September. The voyage occupied a period of thirty-one days; the temperature on board ship being maintained at about 20° Fahr. Subsequently the beef was warehoused in the Victoria Dock Store, at a temperature of about 16° Fahr. The beef from which this sample was taken was good average quality River Plate ox, of about 3 years old.

C.—A sample of prime English steer of the Norfolk breed (the shin weighing about 10 lb.), freshly killed and brought to the Smithfield market for sale on 1st January, 1907.

D.—2 lb. of Argentine chilled steak, *ex* "Highland Laird." The remarks in connection with sample A apply also to sample D.

E.—2 lb. of Argentine frozen steak, *ex* "Highland Mary." Remarks concerning sample B apply also to sample E.

F.—2 lb. of English steak taken from a prime English steer of Norfolk breed. Remarks concerning sample C apply also to sample F.

My analysis of the lean meat from these samples gave in percentages:—

	Beef Shins.			Beef Steaks.		
	A	B	C	D	E	F
	Argentine Chilled.	Argentine Frozen.	English.	Argentine Chilled.	Argentine Frozen.	English.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Water	74·32	74·84	75·66	66·28	74·84	64·47
Fat...	1·27	0·88	1·11	9·18	2·90	13·04
Meat fibre extractives and associated mineral matter.	24·41	24·28	23·23	24·54	22·26	22·49
	100·00	100·00	100·00	100·00	100·00	100·00
Total nitrogen	3·21	3·34	3·13	2·88	2·56	2·73

Comparative Values for making Soups or Gravies.

In order to ascertain whether the process employed for preserving the carcases modified in any way the suitability of the meat for this purpose, analyses of the hot-water extracts of the nitrogenous portions of the above shins were carried out.

In the first place the shins were carefully weighed, and the proportions of fat, lean, and bone ascertained. These results are given in the following table:—

	Shin A. Argentine Chilled.	Shin B. Argentine Frozen.	Shin C. English.
	Original weight, 10 lb.	Original weight, 9 lb. 4 oz.	Original weight, 10 lb. 3 oz.
	per cent.	per cent.	per cent.
Lean meat	50·0	45·3	49·1
Fat and waste	6·2	4·7	10·4
Bone	43·1	48·7	40·5
Loss in cutting	0·7	1·3	0·0
	100·0	100·0	100·0

The percentages show the relative values of these individual samples, and whilst this particular hard-frozen shin, "B," was the least economical, owing to the fact that it contained the greatest percentage of bone and the least percentage of lean meat, the chilled sample "A" gives the best value for money, as it contains the largest percentage of useful lean meat for making soups and gravies.

The English sample, "C," although heavier, is derived from a smaller animal, as the percentage of bone is much less than the other two. The weight of this joint is due to the much larger quantity of fat and waste. This result is confirmed by the fact that the amount of disseminated fat is about the same, if anything being slightly less in the English sample, thus showing that the English feeding had produced fat in large masses, which for this purpose should be regarded as extraneous, having only a value as dripping.

Comparative Values of Extracts (by hot water) from Shins.

1 lb. of the lean meat, minced in a sausage machine, was digested in a covered, jacketed saucepan with 1 pint of water, kept simmering for six hours, and then strained through muslin. The undissolved residue was pressed and weighed in the moist state. The strained "beef tea" was allowed to stand in a cold place till the fat separated; this was then removed and weighed. The sediment that deposited was also collected and weighed; it consisted mainly of coagulated albumen. The liquid on cooling formed nearly clear jellies; "A" and "B" about equally firm, "C" of decidedly less consistency. They had in each case a natural acidity, and the odour and taste were normal.

The quantitles obtained were as follows:—

Quantity taken—1 lb. Minced Lean Meat.	Shin A. Argentine Chilled.	Shin B. Argentine Frozen.	Shin C. English.
Volume of beef tea obtained—			
Cubic centimeters	580	610	665
Fluid ounces	20·4	21·5	23·4
Fat separated when cold	4·5 grammes = 1·0 %	6 grammes = 1·3 %	3 grammes = 0·65 %
Residue of undissolved meat	11 oz = 68·8 %	10 oz. = 62·5 %	11 oz. = 68·8 %
Sediment, mainly coagulated albumen	15 grammes = 3·3 %	9 grammes = 1·9 %	10 grammes = 2·2 %

The dietetic value of these extracts will depend upon the quantity and quality of the dissolved portions. From the percentage of undissolved residue it can be inferred that the hard-frozen sample has yielded up the greatest amount of useful material, whilst the chilled and English samples show identical quantities extracted.

On subjecting the beef teas to a chemical analysis no difference was found in the three samples worth comment, as the figures are very close and become

almost identical when an allowance is made for the valuations in volume. The following are the percentages obtained:—

	Shin A. Argentine Chilled.	Shin B. Argentine Frozen.	Shin C. English.
	per cent.	per cent.	per cent.
Water	96·05	96·52	96·17
Mineral matter	0·42	0·42	0·48
Organic solids	3·53	3·06	3·35
	100·00	100·00	100·00
Total nitrogen	0·59	0·51	0·55
Ratio of nitrogen to organic solids	1 to 6	1 to 6	1 to 6

Since the ratio of nitrogen to total solids is the same in chilled and frozen shins as that in the fresh one, no hydrolysis or putrefactive change has occurred in the preserved samples. Even a slight decomposition would have disturbed the nitrogen ratio.

That the gelatine and albuminoids in the frozen and chilled meats had not been degraded by refrigeration was shown by the consistency of the jellies, as already mentioned.

Phosphotungstic acid, which throws down in addition to the albuminoids a considerable proportion of the meat bases, gave an equal precipitate with B and C, and a slightly higher one with A.

Comparative Digestibility.

By artificial digestion experiments, using pepsin as the hydrolytic agent, it is possible to ascertain whether the different processes employed for preserving the samples modify the digestibility of the meat. The beef steaks already described were taken for these trials; they were first carefully weighed and trimmed from loose fat and connective tissue. After trimming in this way the available lean portions for digestion were as follows:—

	Steak D. Argentine Chilled.	Steak E. Argentine Frozen.	Steak F. English.
Weighed as received	2 lb.	2 lb. 2 oz.	2 lb. 4 oz.
Weight of fat and skin removed...	5 oz.	5 oz.	10 oz.
Available percentage	84·4 %	85·3 %	72·2 %

The remarks as to the excessive amount of fat in the English shin apply, therefore, also to the steak, so that—notwithstanding the higher amount of water in the hard frozen sample, owing to the small percentage of fat, as shown in the preceding table—the quantity of available lean meat per lb. in the English and frozen Argentine beef is the same.

The fats separated were all nearly white.

The method adopted in the digestion experiments was to digest 20 grammes of the finely-minced meat with 20 cc. of ·5 solution of B.P. pepsin, 50 cc. distilled water, and 1 cc. $\frac{N}{10}$ HCl, at a temperature of 38° C., for one hour. The undigested residue was filtered off, carefully washed, dried, and treated

with successive quantities of benzene to remove any remaining fat. The residue left after this treatment was weighed, the weight giving the amount of undigested matter in 20 grammes of meat. The percentages obtained in this way are tabulated below:—

	Steak D. Argentine Chilled.	Steak E. Argentine Frozen.	Steak F. English.
	per cent.	per cent.	per cent.
Percentage of nitrogenous organic matter undigested	38·01	30·11	36·22
Showing digested	61·99	69·89	63·78

The tenderness of meat which has been frozen has often been noticed, and has been attributed to the slow continuous action of the sarcalactic acid, whilst the loosening of the intermuscular tissue promotes rapid decomposition. In these samples this solvent action has not caused any increase in the digestibility of the fibrin, nor have any signs of incipient decomposition been detected, either in the frozen or chilled steak.

II.—Lamb and Mutton.

The second part of this inquiry deals with the relative value of hard-frozen Australian lamb and mutton as against home-killed meat. For this purpose Welsh lamb and English mutton were bought at Smithfield market on the 1st January, 1907, and compared with Australian lamb killed early in October, 1906, and with Australian mutton also killed about the same time, but shipped by a different steamer. The particulars of these four joints are as follows:—

G.—A leg of prime young Welsh lamb, being a cross between the Welsh and Radnor strains, weighing about 5 lb., brought to Smithfield Market for sale on 1st January, 1907.

H.—One leg of prime Australian frozen lamb of the well-known "Champion" brand, weighing 5½ lb. It was shipped by the "Tropic," which steamer arrived in London on the 18th December, after a voyage occupying about fifty-two days, during which the meat was kept at a temperature of about 20° Fahr. The lamb had subsequently been kept in the Victoria Dock Store at a temperature of about 16° Fahr. The tab attached to the leg indicated that the lamb was of grade 4 (*i.e.*, weighing between 42 and 50 lb.), and certified that the carcass was perfectly sound, free from disease, and suitable for human consumption. The lamb was loaded on steamer on 27th October, 1906, and was killed probably about a fortnight or three weeks prior to that date.

J.—One leg of English mutton of the Leicester breed, bred and fattened at Taunton, and offered for sale on the Smithfield Market on 1st January, 1907. The sample leg weighed about 9 lb., and was fully representative of the characteristics of the Leicester strain.

K.—One leg of Australian frozen mutton of the well-known "Champion" brand. It was shipped by the "Runic," which arrived in London on the 24th December, the duration of the voyage, temperature, &c., in the case of sample H applying also to sample K. The Australian leg of mutton also weighed about 9 lb. It bore a tab indicating that

the mutton was of grade 6 (*i.e.*, between 60 and 65 lb.), and including a certificate similar to that on sample H. The mutton was killed about the middle of October, and was put on board steamer on 5th November.

It has frequently been alleged in the past that frozen meat is more wasteful than English, that it diminishes in weight more in proportion during the cooking process, has more refuse parts, which cannot be consumed, and less dripping and gravy. These objections have been refuted from time to time, and were specially reported on in the "Hospital" in 1896, dealing with New Zealand mutton. Since that date no further tests have been brought to my notice. I, therefore, according to your instructions, repeated these baking tests with the above legs of Australian lamb and mutton, and followed the detailed methods of baking in every particular as in the former trials. My results are as follows:—

	G Welsh Lamb.	H Australian Lamb.	J English Mutton.	K Australian Mutton.
	lb. oz.	lb. oz.	lb. oz.	lb. oz.
Weight when delivered	4 15	5 7½	8 10	8 9
Weight when taken from oven	4 2½	4 15	6 13½	6 7¼
Weight of slices suitable for hospital diet.	2 13½	3 8¾	4 4½	4 6
Weight of bone and waste	1 0½	1 1½	2 4	1 11
Pure bone	0 9	0 8¾	1 2	0 13
Dripping	0 4¾	0 4¾	0 11¾	1 0½
Gravy in dish after carving	0 1½	0 2	0 0¾	0 3½
Gravy under dripping	0 0½	0 0¼	0 0¼	0 0½

The closeness in the results of the English and Australian mutton is remarkable. As in the "Hospital" experiment with New Zealand mutton, no difference can be discovered of any material significance. Instead of more waste, less dripping and less gravy, the Colonial produce in this case had slightly less waste, more dripping, and more gravy, together with a trifle greater weight of slices suitable for diet, although the original weight was 1 oz. less than the English joint. It would, however, be unfair to mention such slight advantages were it not that in each case the differences are so small as to show that the two joints are practically identical in every respect. As a matter of fact, the cook who carried out my instructions believed that the two joints of lamb were foreign, and that the two large joints were English mutton, while the slices when prepared for table were indistinguishable by the consumers (in a private boarding-house in London). The consumers numbered about fifteen persons, who pronounced all the kinds to be of excellent quality, but invariably expressed a preference for sample "H" (Australian lamb).

From the above figures I have calculated the percentages of loss in the oven, the amount of useful slices, and the amount of dripping, as shown in the following table:—

	G Welsh Lamb.	H Australian Lamb.	J English Mutton.	K Australian Mutton.
	per cent.	per cent.	per cent.	per cent.
Loss in oven	15·8	9·7	20·6	24·6
Useful slices	57·6	65·0	49·6	51·1
Dripping	6 0	5·4	8·5	12·0

Digestibility of the Cooked Meat.

In order to ascertain the relative food value of the cooked meat, I have determined the quantity of water, fat, and nitrogenous matter in the cooked slices. These were carefully trimmed from all visible fat, minced, and digested with pepsin in the way I have described in the beef experiments. The results are tabulated as follows:—

	G Welsh Lamb.	H Australian Lamb.	J English Mutton.	K Australian Mutton.
	per cent.	per cent.	per cent.	per cent.
Water	58·55	57·65	57·79	57·32
Fat	4·11	6·62	7·53	9·68
Organic matter and associated mineral matter	37·34	35·73	34·68	33·00
	100·00	100·00	100·00	100·00
Percentage of nitrogenous organic matter digested	19·91	15·25	18·20	12·48

These results show a very close resemblance in the amount of water in the cooked samples; and confirm the fact already noticed that the amount of disseminated fat is larger in the "K" sample than in the others.

It is satisfactory to find the general opinion confirmed that no incipient decomposition or hydrolysis takes place under cold storage, while these further series of tests also fully support the favourable conclusions arrived at as the result of previous experiments, by further illustrating the satisfactory food values of frozen mutton and lamb.

Progress Report from Mr. W. W. Froggatt.

[MR. FROGGATT is travelling on behalf of the Governments of Queensland, New South Wales, Victoria, and South Australia, in quest of means of combating the fruit-fly and codling moth pests, and other fruit and plant diseases.]

Washington, D.C., U.S.A.,
13 October, 1907.

Sir,

I have the honor to forward you a progress report of my movements and work since I left California on the 17th of September last. I found that it would be quicker and cheaper to come straight across to Washington than to come *via* Texas, as I had first proposed, particularly as I could easily see the cotton weevil work on my road to Mexico.

I arrived here on Sunday morning, 22nd September, 1907, and on Monday went up to the Agricultural Department, where I presented my credentials to Dr. L. O. Howard, Chief of the Staff, and had a long talk with him about the most advantageous way of spending my time and seeing the inner working of all these divisions and branches into which the Department of Agriculture is divided at Washington. Through his kindness, I have been enabled to go about and interview all the officers and see the methods they adopt in breeding specimens, looking after their specimens, books, and materials.

There are over 10,000 persons in the Department of Agriculture at Washington and scattered through the Federal offices in the United States; there are 300 in the Entomological Division, and in the Plant Pathology and other groups of this division under Dr. Galloway there are seventy botanists at work alone. Each of the leading entomologists under Dr. Howard is a specialist on a certain group of insects; thus—Dr. Hopkins deals only with forest insects; Professor Webster, with insects infesting field crops; Marlatt, scale insects and the best methods of dealing with them; Quantance, with those on fruit-trees and truck crops; and Banks, with ticks and animal parasites, and so on; therefore, they can get through a great deal of original work, besides answering correspondence. Besides this, there is a large staff of workers at the National Museum, each in charge of a different group of insects, who are also under Dr. Howard. With all these officers I have spent some time, and they have been very kind in placing all their information at my disposal. One of the greatest time-saving methods is the card catalogue system in all branches of work, even extending it to the collections.

I have specially inquired into the habits of all cosmopolitan pests and the methods adopted here and in other parts of the States, and the range of the insects, but will not enlarge upon it in this report, as it would take up too much of your time, but have recorded all my observations in my journal. The two species of fruit-flies found in the New England States are not known in the west or southern States. *Trypeta pomonella* is very common in the State of New York, and damages as many apples as the codling moth does in some years; but the commercial orchards are of very small extent, and very little is done to keep it in check. The same might be said of the

cherry fruit-fly (*Trypeta cingulata*), which is common in cherries in the same districts. The climatic conditions and the neglect of orchards will not furnish us with any suggestions in our work of fruit-fly destruction. I have met Mr. Gilles, in charge of silk-work culture, a business that the Department is introducing into the southern States. They supply the eggs, instructions, and mulberry plants free to anyone who will take the business up, and then buy the cocoons from the growers at a little above market price, spin the thread in the Departmental workshops, and sell it to the silk manufacturers.

The bee culture, under Dr. Phillips, is another important branch, as there are over 500,000 bee-keepers in the United States. The bacteriologist in this branch would be very glad to get specimens of bee paralysis from Australia, and would acknowledge and furnish reports upon any specimens received; specimens of foul brood would also be interesting to him. They have here a special Fairbanks' scales, which will weight from 400 lb. to ¼ of an ounce, and on this they are testing a hive of bees to find out the "activities of a hive," and with regular observations, regularly recorded, expect to get some interesting results.

I spent a most interesting day in the division of Plant Pathology, where Dr. Galloway sent me round to all his officers; and, among others, I had a very interesting time with Mr. Swingle, who is interested in the dry-farming cultivation, and has travelled extensively in Asia and Northern Africa. He is very much interested in our western flora and edible shrubs and plants. Among other interesting questions he pointed out that it was not a spineless cactus that we want in dry countries, but such a spiny one that nothing will touch it until the spines are burnt off. A spineless cactus, he maintains, would never hold its own in desert country; everything, from the mice to the mules, would eat it out. He showed me a species (*Opuntia fulgida*), which is such a mass of spines when young that nothing can come near it; but the spines are so thick and dry that they are like matchwood, and this species grows a great quantity of fruit, that is a very valuable food to stock. He is also greatly interested in the cultivation of dates in the dry country, and thinks that we should also be able to grow dates commercially in Australia.

In the Investigation of Plants division, Mr. Collins went into the question of cotton and also maize, and said that some of the species obtained in the arid parts of Mexico will mature in three months, and they are carrying out extensive experiments in these dry-lands varieties of maize. The germination of seeds is a special branch of this division, and the purity of all seeds sold in the United States is tested here. Miss Schofield, in charge, has all the seeds examined under the microscope, and the foreign seeds, inert matter, and seeds all listed and determined.

With Dr. True, of the same division, I had some interesting conversations regarding the diseases of stock caused by native plants, and he informed me that "Loco" disease in the eastern parts of the Rocky Mountains round to Arizona and Mexico, is very similar in its effects upon stock, and horses in particular, to our "Darling Pea," and last year in some places as many as 75 per cent. of the horses in Arizona died from this disease, caused by eating several species of *Astragulus* and *Argullus*. Several species of wild lupins (*Delphinus*) also often kill large numbers of stock in the West, particularly sheep.

I also called upon Dr. Cobb, who has a branch under Dr. Galloway, who is only just getting things together in his branch; he wished to be remembered to all the officers of our Department. Another morning was spent with Drs. Mueller, Dorset, and Hassell, who have charge of the branches of Bureau of Animal Industry, and deal with much of the work undertaken by our Stock Branch. The Biographical Survey deals with investigations as to the spread and range of useful and injurious birds and animals. In the absence of Dr. Merriman, Dr. Fisher took me through the offices and explained the trouble that they had in the north-west with the ground-squirrels, which destroy grass and crops, just like our rabbits. Poisoning with phosphorus or other mixtures is the chief method of extermination; but it has been stated that a few years ago a contagious disease sprang up amongst them, and in some places they all died out. Dr. Piper has been investigating this matter. The Bureau of Forestry was also visited, and the officers in that branch gave me much interesting information about their methods of dealing with the forest areas. Most of the United States forests are in the west and north-west, and consist chiefly of conifers. Replanting is not practised on a large scale, but the forests belonging to the Government are waste lands, much of them in the free-range districts. The free-range system has grown up into one of the greatest evils to settlement in the States. There are millions of acres for which the State gets no rent in the occupation of sheep and cattle men, who are eating out the grass and fighting among themselves to hold the land of which none of them have any right or title.

The Weather Bureau is also closely connected with the Department of Agriculture, as they issue warnings as to rain or frost indications that are carefully watched by fruit-growers, farmers, and others interested in agriculture. They issue two weather-charts every day. The observations are taken all over the States, from Edmonton in the far north of Canada to Porto Rico in the West Indies, and at 10.30 a.m. the same morning all these reports are tabulated and ready for publication.

Last week, 7th October, I went to Ithaca and visited Cornell University as one of the most typical agricultural colleges in the United States, where Professor Comstock showed me all their work, and the arrangement of specimens for their teaching work. Professor Slingerland showed me his methods of making lantern-slides and other work. Dr. Needham took me down to his marsh lands experiments, where all water insects, mosquitoes, and fish can be continuously observed under natural conditions, and the reclamation of marsh lands studied.

From there I went to Boston to study the work of the Gipsy Moth and Brown Tail Moth Commission. The State Commissioners have a force of 1,000 men engaged burning off underbrush, burning egg clusters, bandaging the trunks, and spraying the foliage of the infested forests. The State of Massachusetts votes part of the money, and each town in the infested districts has to tax itself so much per valuation of property, and at the same time the Federal Department has voted a sum to deal with the introduction of parasitic enemies of these moths in their native home (Europe), and thousands of such parasites are being liberated in these infested areas. The result of these parasites will be watched by the economic entomologists all over the world. I went over about 200 miles of the infested area with the State Commissioner. I have now arranged to leave on the 15th (next

Tuesday) for Texas, where the Cotton Boll Weevil Commission is working, and after a few days' stay in the district of Dallas will proceed to the City of Mexico, *via* San Antonio, to investigate the Mexican Fruit-fly (*Trypeta ludens*) and its parasites, and, if feasible, shall forward consignments of infested pupæ direct to our Entomological Branch.

I have, &c.,
WALTER W. FROGGATT.

To The Hon. Minister for Mines and Agriculture,
Sydney, New South Wales.

Tall-stemmed Large-fruited Strawberry.

The firm of Vilmorin-Andrieux, which has already propagated several very interesting varieties, has now brought out a novelty in strawberries, which presents some extraordinary characteristics. This is the long-stemmed strawberry with large fruit—Queen of August. It is the result of a cross between the strawberries Dr. Morère and Saint Joseph. It has been carefully cultivated for several years in order to fix its special characteristic of tall growth. It is also very prolific, which is another great merit. The fruit is large and tapering, and scarlet when ripe. The flesh is firm, rose-coloured, very juicy, and slightly acid. It seems likely to turn out a great success, and has received a Certificate of Merit from the National Society of Horticulture.—P. Florent, *Journal d'Agriculture.*

A list of Butter Factories of New South Wales.

Factory.	Brand at present in use.
Avon and Barrington Co-operative Dairy Co., Gloucester ...	A.B.C. (name of Co.).
Albury Co-operative Butter Factory and Produce Co., Ltd., Albury.	Brio, Willock. Wongwah.
Albury Co-operative Butter Factory and Produce Co., Ltd., Cootamundra.	C.A., Cootamundra.
Alstonville Co-operative Refrigerating Co., Ltd., Alstonville.	Empress.
Argyle Co-operative Central Dairy Co., Ltd., Goulburn ...	Thistle.
Australian Chilling and Freezing Co., Ltd., Aberdeen ...	Thistledown, Thistle brand (fig. of thistle).
Berrima District Farm and Dairy Co., Ltd., 664, Harris-street, Sydney.	Wombat, Kangaroo.
Bathurst Co-operative Dairy Co., Ltd., Bathurst	Bathurst.
Bega Co-operative Creamery Co., Ltd., Bega...	Bega, Burrawang.
Bellinger Central Co-operative Butter Factory, Ltd., Raleigh	Boronia, Raleigh.
Bellinger Central Butter Factory, Fernmount	Bellingen, Fernmount.
Braidwood Co-operative Dairying Co., Ltd., Braidwood ...	Braidwood.
Bemboka Co-operative Butter Co., Ltd., Bemboka	B.B., Bemboka.
Burrundulla Dairy Co., Ltd., Mudgee	Burrundulla.
Thomas Blunt, Overton Creamery, Muswellbrook	Overton.
Bowthorne Co-operative Dairy Co., Ltd., Hinton	Bowthorne (fig. bow and arrow).
Blanch, G. A. E., Southampton Butter Factory, South Grafton.	Hyacinth, Owara.
Brooklet Co-operative Dairying Co., Ltd., Brooklet	Seaview.
Ballina Co-operative Refrigerating and Produce Co., Ltd., Ballina.	Ballina, Uralba, Duramboi.
Berry Central Butter Factory, Berry	Berry, Lillipilli.
Bacchus Marsh Concentrated Milk Co., Ltd., 297, Clarence-street, Sydney, and at Bomaderry.	Bacchus Marsh, Bomaderry.
Black Mountain Dairy Co., Ltd., Black Mountain	Bora.
Barrengarry Dairy Co., Ltd., Barrengarry	Lion.
Braemia Co-operative Dairy Co., Ltd., Denman	Braemia.
Clarence River Pioneer Dairy Co., Ltd., Ulmarra	Pioneer, Calliope.
Camden Park Estate, Ltd., Menangle	Laurel.
Clarence River Co-operative Butter and Refrigerating Co., Ltd., Maclean.	Nymboida (fig. of horse-shoe).
Casino Co-operative Dairy Co., Ltd., Casino	Casino, Coronet.
Cooyal District Butter Co., Ltd., Mudgee	Cooyal.
Cathcart Co-operative Dairy Co., Ltd., Cathcart	Cathcart.
Castle Mountain Co-operative Butter Factory, Ltd., Castle Mountain.	Castle Mountain.
Crookwell Butter Factory Co., Ltd., Crookwell	Victory, Crookwalla.
Cowra Co-operative Dairy Co., Ltd., Cowra	Cowra.

A LIST of Butter Factories—*continued.*

Factory.	Brand at present in use.
Copmanhurst Co-operative Dairy Co., Ltd., Copmanhurst ...	Comhurst.
Candelo Co-operative Dairy Co., Ltd., Candelo	Lilac, Moana, and Candelo.
Coraki Co-operative Butter Co., Ltd., Coraki...	Southern Cross, Silverstream, Greenleaf, Coraki.
Cudgegong Dairy Co., Ltd., Cudgegong...	———
Cobargo District Co-operative Creamery Butter Co., Ltd., Cobargo.	Emu (fig.), Narira.
Cessnock Butter Factory, Cessnock	Koh-i-noor, Dianthus.
Curtis and Curtis, Harbour-street, Sydney	Magnum.
Dungog Co-operative Butter Factory, Ltd., Dungog ...	Prairie, Durham.
Debenham, F., Frederickton	Anchor.
Dorrigo Central Co-operative Dairy Co., Ltd., Dorrigo ...	Alpine, Dorrigo. (fig. of triangle).
Duckenfield Co-operative Dairy Co., Ld., Morpeth	Stockman.
Deniliquin Co-operative Butter Factory and Farm Produce Co., Ltd., Deniliquin.	———
Eugowra Co-operative Dairy Co., Ltd., Eugowra	Eugowra.
Foley Brothers, Ltd.—	
Sydney	Meadow, Baroona, and Native Rose.
Cootamundra	Golden Rose.
Cambewarra	———
Lismore	Daphne, Shorthorn, Northern Central.
Farmers and Settlers' Co-operative Society, Ltd., Blayney	Snowdrop
Do do do Kangaroo Valley	Kangaroo (fig.).
Forrester, A. C., Branxton	White Swan.
Foxground Co-operative Dairy Co., Ltd., Foxground ...	Glen.
Farmers and Dairymen's Milk Co., Ltd., Harris-street, Sydney.	Golden Cow.
Forbes Co-operative Dairy Co. Ltd., Forbes	Forbes.
Grabben Gullen Butter Factory, Ltd., Grabben Gullen ...	Grabben Gullen.
Gordon and Binnie, Singleton	Maeranie.
Gerringong Dairy Co., Ltd., Gerringong	Gerringong.
Gloucester District Co-operative Butter Factory, Ltd., Stroud.	Karuah, Stroud.
Glen Innes Co-operative Butter Factory, Ltd., Glen Innes...	Hyland, Golden Wattle.
Gleniffer Central Dairy Co., Ltd., Gleniffer	Glenfalls, Gleniffer.
Gurrunda Co-operative Butter Factory, Ltd., Gurrunda ...	Gurrunda.
Gundagai Co-operative Butter Factory, Ld., Gundagai ...	Gundagai.
Gunnedah District Co-operative Butter Factory, Ltd., Gunnedah.	———
Gresford Butter Factory Co., Ltd., East Gresford	———
Hastings District Co-operative Dairy Co., Ltd., Port Macquarie.	Hastings, Koala, Bullhead.
Hay Co-operative Butter Factory Co., Ltd., Hay	Waradgery.
Inverell Co-operative Butter Factory, Ltd., Inverell... ...	Willow.
Ireland, J., Ltd., Newcastle	Rosebud.
Illawarra Co-operative Central Dairy Co., Ltd., Albion Park	Warrilla.
Jamberoo Central Dairy Co., Ltd., Jamberoo	Waughope.
Kyogle Co-operative Dairy Co., Ltd., Kyogle	Kyogle.
Kangaloon Co-operative Dairy Co., Ltd., Kangaloon... ...	Kangaloon.

A LIST of Butter Factories—*continued.*

Factory.	Brand at present in use.
Kialla Butter Factory Co., Ltd., Kialla	Crookwell.
Kangaroo River Co-operative Dairy Co., Ltd., Kangaroo Valley.	Kangaroo River.
Leconfield Butter Factory Co., Branxton	Leconfield.
Lismore Co-operative Dairy Co., Ltd., Lismore	Countess, Wonga, and Ululu.
Manning River Co-operative Dairy Co., Ltd., Jones' Island	Sun, Pyramid, and Wingham.
Molong District Co-operative Dairy Co., Ltd., Molong ...	Molong.
Millthorpe Butter Factory Co-operative Co., Ltd., Millthorpe	Mulga.
Mudgee District Dairy Co., Ltd., Mudgee	Acacia.
McKinney Bros., Nangus, Gundagai	Nangus.
Macleay River Co-operative Dairy Co., Ltd., Kempsey ...	Yaelwood, Kempsey.
McLean Co-operative Dairy Co., Ltd., Maclean	Nealcam.
Nowra Co-operative Dairy Co., Ltd., Nowra	Nowra, Worrabba, Wilna.
Newell, Joseph, Bulladelah	Acme.
Nambucca Dairy Co., Ltd., Macksville	Utungan, Macksville.
North Coast Co-operative Co., Ltd.—	
Byron Bay	Myee.
South Lismore	Unara.
Murwillumbah	North Coast, Eureka, Cavanba, Noorebar.
Narrabri Co-operative Dairy Co., Ltd., Narrabri	Narrabri.
New South Wales Fresh Food and Ice Co., Ltd., Harbour-street, Sydney.	F.F.I.C. (monogram), Golden Star.
Oakey Creek Dairy Co., Ltd., Cudgegong	——
Orange Co-operative Central Dairy Co., Ltd., Orange ...	Orange.
Orara Co-operative Dairy Co., Ltd., Coramba...	Orara and Coramba, with fig. of Phœnix.
Palmer's Island Co-operative Dairy Co., Ltd., Palmer's Island.	Cycle, Merista.
Parkes Co-operative Dairy Co., Ltd., Parkes	Parkes.
Pambula Co-operative Dairy Co., Ltd., Pambula	Oakleaf.
Rylstone Co-operative Dairy Co., Ltd., Rylstone	Rylstone Co-op. Dairy Co.
Raymond Terrace Co-operative Dairy Co., Ltd., Raymond Terrace.	Oak.
Rocky Hall Co-operative Dairy Co., Ltd., Rocky Hall ...	Rocky Hall.
Rohr, G. J., Wagga...	Riverina.
Reid, J. H., Tenterfield	Cottisbrook.
Southgate Co-operative Dairy Co., Ltd., Ulmarra	Crescent.
Smithtown Dairy Produce Co., Ltd., Smithtown	Smithtown Co-op. Dairy Co.
Singleton Farming and Dairying Co., Ltd., Singleton ...	Singleton.
Singleton Central Co-operative Dairy Co., Ltd., Singleton...	Almond, Bushman.
Stewart, A. C., Union Creamery, Cathcart	Fairview.
Southern Monaro Co-operative Dairy Co., Ltd., Nimitybelle	Southern Monaro.
Skillen & Co., Dungog	Heather Bell.
Scottish Australian Investment Co., Ltd., Adaminaby ...	Bolaro.

A LIST of Butter Factories—*continued.*

Factory.	Brand at present in use.
South Wolumla Co-operative Creamery, Ltd., Wolumla ...	Buttercup, Wolumla.
Tremayne Bros., Wellington	———
Tweed River Co-operative Dairy Co., Ltd., Murwillumbah ...	Lily.
Tenterfield Co-operative Dairy Co., Ltd., Tenterfield... ...	Pansy, Celosia.
Tamworth Co-operative Dairy Co., Ltd., Tamworth	Tamworth.
Towamba Central Co-operative Creamery, Ltd., Towamba ...	C.C.C.C.
Tumut Co-operative Butter Factory, Ltd., Tumut	Gadara, Tumut Valley.
Upper Macleay Co-operative Dairy Co., Ltd., Hickey's Creek	Upper Macleay.
Upper Bellingen Co-operative Dairy Co., Ltd., Bellingen ...	Orchid.
Upper Wallamba Co-operative Dairy Co., Ltd., Krambach...	Rock Lily, Rock, Banksia.
Upper Manning Co-operative Dairy Co., Ltd., Taree ...	Taree, Upper Manning.
Ulladulla Co-operative Refrigerating Butter Co., Ltd., Milton	Ulladulla, Boomerang, Lion and Kangaroo.
Uralla Co-operative Butter and Bacon Co., Ltd., Uralla ..	Allaru.
Unanderra Co-operative Dairy Co., Ltd., Unanderra ..	———
Woodhill Co-operative Dairy Co., Ltd., Woodhill	Woodluff, Airlie.
Woodburn Dairy Co., Ltd., Woodburn	Atlas, Wyambah, Budgeree.
West End Creamery Co-operative Co., Ltd., Bemboka ..	Fern (fig. of fern leaf).
Winkley & Co., G., Forest Hills Creamery, West Maitland...	Hillcrest, Mindaribba.
Withycombe, C. J., Millgrove Creamery, Muswellbrook ...	Millgrove.
Wingham Co-operative Dairy Co., Ltd., Wingham	———
Woodstock Co-operative Dairy Co., Ltd., Jamberoo	———
Wilde's Meadow and Yarrunga Dairy Co., Ltd., Wilde's Meadow.	Wilde's Meadow and Yarrunga Dairy Co.
William White, Butter Factory, Tumut	Eppeles.
York, Hamilton, Central Butter Factory and Ice Works Quirindi.	Quirindi.

Rural Hygiene.

THE importance of keeping the closets in the country in a sanitary condition is hardly realised. There is absolutely no reason why these places should be in the unclean and insanitary condition they frequently are. They are too often a harbour and breeding-ground for flies, which are notorious as carriers of disease, are kept in a state of disrepair, with unsuitable or leaky buckets, and are generally a place of corruption and evil smells. If there was any difficulty about maintaining these places in a sanitary condition it would be a different matter, but the means for keeping the closets in a perfectly sweet and wholesome state are to hand everywhere in the country. The following extract from *The World's Work,* dealing with Dr. Poore's Rural Hygiene, by Mr. Allport, author of "Inexpensive Holiday Homes," is of interest to farmers, butter factory managers, and all dwellers in areas not served by sewage or municipal sanitary systems.

"As one who takes a great interest in this subject, and who had the advantage of frequent discussion with the deceased reformer, both on his Andover property and elsewhere, may I be allowed to give the results of my own practical experience of his methods with regard to solid and liquid sewage. I have for about five years adopted his systems at a country bungalow of my own, and although I believe his theories to be practically right, I have found that there are several points not generally known which materially affect their satisfactory working. When going over with the doctor his bountifully manured garden at Andover, we turned over the soil in several places at which the dates of manuring were known. And we found, even where twelve months had elapsed, there were still frequent instances of excrement quite undecomposed.

"His plan was to bury the excreta in a 6-inch trench, and put the soil removed in forming the next trench on top. I have found that if no trench is made, the contents of the buckets being put *on the surface,* and only sufficient soil to conceal their character raked over them, the decomposition is exceedingly rapid, a few weeks destroying all trace of organic matter. The application is best made in the intervals between already growing plants, which are never injured by it.

"There is one matter in this connection which should be insisted upon. Each closet should have two buckets to be used alternately, the one just emptied being as recommended by Dr. Poore, rinsed with dry earth, *then put under cover, in the open air,* until its turn for use comes round. It will then be absolutely free from odour. Ignorance of this essential condition is responsible for all, or nearly, the prejudice against the earth closet.

"I find an admixture of roughly sifted peat-moss litter (not obtainable here) a great improvement to the earth and ashes generally employed in earth closets, and I have abandoned all mechanical contrivances in favour of the old-fashioned box and scoop, which are infallible in operation, and do not demand perfectly dry and sifted earth."

Weather Conditions during November, 1907.

A. NOBLE,
Meteorological Department, Sydney Observatory.

On the 1st and 2nd of the month light rain was recorded, chiefly on the coast; but on the 3rd one of the best rainstorms experienced for many months passed over our State. All stations in the extreme north-west and on the extreme north coast participated. The storm, which was responsible for the above useful rainfall, was undoubtedly monsoonal in origin, and developed rapidly. It resulted from the continued agency of monsoonal conditions, operating over Northern Territory on the 1st, and the eastward progression of a so-called Antarctic Depression passing along the shores of the Great Bight. Some of the heaviest falls were:—Kiandra, 336 points; Molong, 334; Junee, 330; Orange, 315; Carcoar, 311; Tumbarumba, 309; Wellington, 251; Young, 258; Mudgee, 270; Murrurundi, 218; Adelong, 215; Burrowa and Cowra, each 218; Rockley, 229; Bathurst, 210; Dubbo, 211; and Cannonbar, 208.

During the period between the 5th and 13th, inclusive, light to moderate rainfall of a partial character was recorded, chiefly over the south-east quadrant, Central Tablelands, and North Coast districts.

Thence, to the 16th, light to moderate falls were registered generally east from the Western Division, and in parts of the North Coast district upwards of an inch was received, the heaviest being: Manning Heads, 225 points; Woolgoolga, 132; Seal Rocks, 130; Clarence Heads, 112; and Byron Bay, 103 points.

As the result of the operations of a well-defined monsoonal disturbance, which intensified on the 16th and 17th, light to heavy and general rain fell throughout the State. This disturbance, before it left our coast, was also responsible on the whole for almost continuous rainfall over the various districts of New South Wales east from the Darling. The heaviest falls during the rainstorm, which lasted from the 16th to the 22nd, were as follow:—Byron Bay, 444 points; Armidale, 333; Murrurundi, 315; Glen Innes, 306; Bundarra, 294; Yetman, 282; Emmaville, 276; Mullumbimby, 263; Inverell, 257; Tabulam, 250; Grafton, 228; Walcha, 222; and Manning River Heads, 196 points.

From the 23rd to the 27th, rainfall, associated with thunder and hail, was recorded over the Metropolitan, Hunter and Manning, Northern Tablelands, North-western Slopes and Plains, as also at isolated places on the North and South Coasts and Central Tablelands. Upwards of an inch in the aggregate

was received in various places, chiefly in the north-east quadrant, as follows:—Bendemeer, 166 points; Bingara, 156; Collarenebri, 150; Mungindi, 131; Murrurundi, 127; Raymond Terrace and Nundle, each 110; Paterson, 107; and Albury, on the South-west Slope, 128 points.

Between the 28th and 30th of the month, light to heavy rain fell along the coast-line, and here and there on the tablelands; the heaviest falls, however, were confined to Northern and Central Coast districts. Byron Bay received 215; Mullumbimby, 218; Kiama, 89; and Jervis Bay, 75 points.

On the whole, the rainfall during the month was both general and beneficial, the major portion of the State having received totals in excess of the average. Defects, however, were experienced at scattered places in each of the subdivisions, excepting Northern Tableland and North-west Plain, where rainfall was generally in excess of the average. The metropolitan area fared worst, all stations showing defect.

The following is a statement of the distribution of rainfall over the various subdivisions of the State during November:—

Division.		Percentages. Above normal.		Below normal.
Over North Coast ...	from ...	56	to	31
,, Hunter and Manning	,, ...	131	,,	52
,, Metropolitan	,, ...	—	...	4 to 53
,, South Coast	,, ...	45	to	65
,, Northern Tableland	,, ...	9 to 70	...	—
,, Central Tableland	,, ..	190	to	45
,, Southern Tableland	,, ...	40	,,	26
,, North-western Slopes	,, ...	87	,,	37
,, Central-western Slopes	,, ...	153	,,	21
,, South-western Slopes	,, ...	170	,,	50
,, North-western Plain	,, ...	25 to 106	...	—
,, Central-western Plain	,, ..	94	to	47
,, Riverina	,, ...	228	,,	22
,, Western Division	,, ...	75	,,	95

The following statement shows a brief comparison of the chief meteorological elements over India, together with Australia, as far as data are available for the month of November, 1907:—

	Departure from normal. Pressure.	Departure from normal. Temperature.	General Conditions (referring to State as a whole).
	Inch.	Degrees.	
India...	− ·02	+1·7	Very dry.
Sydney	+ ·08	− 0·3	Moderately wet.
Melbourne	Equal to ...	+2·8	Moderately dry.
Adelaide	+ ·06	+1·2	Wet.

The above table shows India, Melbourne, and Adelaide to have had temperature considerably in excess of the average, while at Sydney it was slightly in defect.

The pressure results of India and Melbourne were somewhat similar, the former being ·02 below and the latter equal to average. The general weather conditions at these two places were "very dry" and "moderately dry," respectively.

Pressure at Sydney and Adelaide was in excess—in the former + ·08, and the latter + ·06—while the weather conditions of New South Wales and South Australia were "moderately wet" and "wet," respectively.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for November, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·78 17	30·46 7	30·10	44·2 2nd. 3rd.	97 0 26	67·9	68·8	40 2	83 17	58·1	·359 2	8·174	5·709	17

Rainfall...								
Points	48	14½	3	2½	52	35	5½	Total, 160½ points.
Dates	4	6	7	14	18	23	27	

Mean rainfall for 15 years = 204 points.

Wind ...	N	NE	E	S	SW	W	NW
	4	22	3	10	2	4	3

Thunderstorms on 21st, 22nd, 23rd, 26th.

Greatest daily range of temperature = 40·6° on 16th.

Days on which shade temperature rose above 90° = $\frac{90·6°}{16}$ $\frac{90·2°}{22}$ $\frac{92·6°}{23}$ $\frac{97°}{26}$ $\frac{90·8°}{30}$

W. MERVYN CARNE,
Observer.

Orchard Notes

W. J. ALLEN.

January.

Codling Moth.—Growers of pears, apples, and quinces will find that they will have to give the strictest attention to the bandaging of trees, as also to picking up and from the trees of all infested fruit, if they hope to be able to market anything like a decent percentage of clean fruit. The bandages must be examined, and all grubs destroyed which are found hidden underneath, at intervals of eight days, and the fruit picked up every few days, and either boiled or burnt, so that the grubs cannot possibly escape alive.

Acetate of Lead Spray for Codling Moth.

The formula recommended by the Georgia State Board of Entomology (*Bulletin* 19), is as follows:—

Acetate of lead	11 oz.
Arsenate of soda	4 oz.
Water	50 gals.

Dissolve in separate vessels, the lead in 1 gal. water, and the arsenate of soda in 2 gals. water. Use wooden buckets for preference. Pour the arsenate solution into the lead solution. Add to 50 gals. water, and stir well. Ready for use.

Comparative cost—

	s.	d.	
(*a*) 11 oz. acetate of lead, at 6d. per lb. =	0	4	
4 oz. arsenate of soda, at 6d. per lb. =	0	1½	
	0	5½	for 50 gals

To get the same amount of arsenate of lead per 50 gals., using Swift's arsenate of lead, you would require—

(*b*) 10 oz. arsenate of lead, at 1s. 3d. per lb. = 9½d. for 50 gals.

The Victorian formula for arsenate of lead is—

	s.	d	
(*c*) 1 lb. arsenic, at 1s. 3d. per lb. =	1	3	
2 lb. carb. soda, at 2d. ,, =	0	4	
7 lb. acetate of lead, at 6d. per lb. =	3	6	
	5	1	for 360 gals.
or	0	8½	for 50 gals.

Fruit Fly.—All infested fruit, whether on the tree or on the ground, must be gathered and destroyed by boiling or burning, and no fruit must be allowed to remain on the ground longer than three days before being picked up.

It has been reported that fruit imported into Victoria from South Australia has been found to be infested with the grub of the fruit fly, but a contradiction appeared later to the effect that they were the larvæ of some other fly.

Red and other Scales on Citrus Trees.—If the trees are in good growing condition, fumigating or spraying may be safely carried on this month, but where trees are suffering from the effects of want of moisture, they should not be treated under any consideration, as either spraying or fumigating would under such conditions be harmful to the tree. The lower the temperature the better will the trees stand either of these processes; therefore never treat trees on a hot day; in fact, during this month fumigating gives best results if carried on at night. When it is found necessary, trees may be sprayed with Bordeaux mixture after fumigating, but under no circumstances must a tree be fumigated after it is sprayed with that mixture.

Fruit-curing.—The last of the apricot crop and the first of the better varieties of peaches for drying purposes will be ripening this month. See that such fruits are handled properly, and do not allow the cured product to become over dry. As soon as properly processed, store in bags until they are to be packed. Pamphlets on fruit-curing can be had on application to the Department of Agriculture.

Cultivation.—Should rain fall during this month, see that the soil is well stirred as soon as it is sufficiently dry to work, or the result will be the loss of a considerable quantity of the moisture so essential for the proper nourishment of the trees. These have had a pretty bad time up to the present this season, more especially in the coastal districts, and as a consequence are in a weakened condition; and therefore we cannot afford to neglect the cultivation, in order that they may derive the greatest benefit from any moisture that falls.

Do not fail to order vetches, peas, rape-seed, or whatever crop it is intended to sow among the trees for green manure, as early as possible, as such crops should be sown without fail early in March, in order that they may put on good growth before being turned under, and before the rains have ceased to fall in the spring. There are many orchards which could be made more productive, if the owners would only give a little more attention to the proper manuring and working of same.

Farm Notes.

Hawkesbury District—January.

H. W. POTTS.

Discouraging as was the outlook in this district twelve months ago, the present conditions are far worse. Recent rainfalls, scanty and patchy as they undoubtedly were, might have been made of service to the crops had they not been followed by scorching winds, which left the ground as bad as ever. The tenant farmer, faced with the necessity of rallying all his resources in order to pay his half-year's rent, feels tempted to give notice at the same time.

However, the key-note of the month's operations must be conservation of such moisture as there is and the sowing of all available ground for green feed and ensilage.

January is practically an off month in several respects, as it is too late to do much for the summer crops, and rather early for the autumn and winter ones. Weather conditions are usually unfavourable for many operations. However, as occasion offers, vigorous preparations should be made for the sowing of turnips, lucerne, barley and vetches for green feed, and the main hay crop.

Maize.—Little can be done to the early crop, but light cultivations, even after hilling (but before the formation of the cob), will possibly be of service. Though it is against local practice to work through the corn after hilling, our experience on the high lands has shown that a light scuffling at that time is often decidedly beneficial. Should a thunderstorm or two come, plantings may be made of any of the standard heavy-leafed varieties, such as Hawkesbury Champion, Red Hogan, Hickory King, or Early Mastodon. Even as late as February, where early frosts are not likely to occur, maize may be sown for ensilage and green feed. Rows 3 ft. 6 in. apart, and the seed sown with a dropper 6 inches in the rows or three or four grains every 2 feet will be found desirable.

Sorghums.—Frequent shallow cultivations must be resorted to in order to keep this crop on the move. Attention to this point may mean all the difference between a good crop and failure, as sorghum is a slow grower in the early stages. It is rather late for sowing, but Early Amber Cane may be tried, while Planters' Friend may give greater yields in situations untouched by early frosts.

Millets.—Many farmers who have deemed it unwise to plant their usual area of corn would do well to devote their attention to these valuable fodders. Hungarian has been found the best here, while White French finds favour in many parts, especially where the seed can be utilised by poultry. Sow at the rate of 7 to 8 lb. per acre, with an ordinary wheat-drill or barrow-sower, and 12 to 14 lb. by hand. It is best to roll the surface previous to sowing, and follow by harrowing lightly, as the seed must not be covered more than an inch or so.

Rape.—For green manure or pig-feed this useful crop may be sown at the latter end of the month, and ground got ready for further sowings in February.

Potatoes.—If weather conditions prove favourable, planting may be started late in January, though the main crop should not be planted till a fortnight or so later.

Swedes and Mangolds.—Sufficient attention is not given to these succulent root-crops, and a small area might well be devoted to them on every farm. Sowings may be started near the end of the month on ground which has received deep and thorough cultivation.

Glen Innes District—January.

R. H. GENNYS.

Harvesting.—Much oats will yet remain to be harvested in New England. These should be cut for hay when the tops are beginning to turn white. Sheaves for hay should not be made too big, in order that they may dry more quickly, three or four only being put in a stook and heads tied with band keeping them close together to throw off rain. If very green or wet, and the outside of sheaves fit, turn them inside out; this will greatly expedite their readiness for stacking. Oats are very liable to heat, and must not be prematurely stacked.

Lucerne Hay.—This crop should be cut for hay when about one-fifth of the crop is in flower. It should be cut with scythe or mowing machine, and not be exposed too long to the sun, but turned over once and put into small cocks to "make" prior to stacking, the point being to preserve as much of the leaf as possible. Better to stack a little early than too late, as brown lucerne that has been slightly heated is not objected to by stock, and often brings good value. Aim, however, for green leafy hay.

Algerian Lucerne is doing fairly well here on the hillsides, but seems slower of growth than the ordinary lucerne. It is early to say as yet what its value really is under Australian conditions; but a few acres here are well set, and time alone can show if it will flourish on hillsides, as it is claimed it will.

Do not feed lucerne too close, as any injury to the crown may ruin the plant. When cutting for hay, too, do not shave too close, for the same reason. It has been shown clearly here that sowing too thickly is injurious. In a dry spell here a plot sown at about 20 lb. per acre was commencing to wither badly when that sown in drills at about 4 lb. per acre was fresh and green.

A middle course in seeding is advised, and on well-cultivated soils and where the best seed is used, 8 lb. per acre will prove in the long run better able to stand adverse climatic conditions than, say, 12 to 15 lb. when sown with a drill, but if broadcasted 12 to 15 lb. per acre is not too much. The plants should form deep vigorous tap-roots, drawing their nutriment from a great depth. It would be well to gather seed only from a crop with well-developed plants. Good seed should be of a bright-yellow colour—not dull-brown nor dark.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

As soon as the harvest is over, farmers with fallowed land should seize every favourable opportunity to get the fallows broken down and in order for planting. Experience at Coolabah has proved that on worked fallows planting can take place, and the seed germinate at the proper season, even though no rain has fallen for two to three months previously, if the moisture has been conserved by harrowing the soil as soon as a crust formed after rain. In addition to conserving the moisture, the working which the soil receives helps to compact it, and so produce that firm ideal seed-bed desirable for the wheat plant, without the aid of special implements like the "Campbell Sub-packer." Working the ground aerates and mellows it, and at the same time destroys weeds, and in connection with keeping ground clean, it is as well to bear in mind that the easiest way to destroy weed seeds is to make them grow, and then kill the plants resulting therefrom.

In July last attention was drawn to the necessity of combining with fallowing some profitable practice of maintaining the supply of organic

matter in the soil. The fact that the harvest this year in most districts is an early one will possibly afford those farmers who do not systematically plan to do this, an opportunity of doing so, in connection with the land to be fallowed next summer. There is every probability that this land, if ploughed early, can be cropped in February, March, or April with rape or tares. These crops, after being fed off at any time from May to September, will leave the soil richer in humus, and the surface soil richer in plant food than if the ground had been spelled all winter. These plants are deep rooters, and obtain a proportion of the plant food used by them from depths below the feeding area of the wheat plant, which has a comparatively shallow root system. This plant food is used to build up their leaves and stems, and when these are ploughed in, becomes mixed with the surface soil, and so is rendered available for the next wheat crop. Such crops are very valuable, for they serve a double purpose in that they furnish a valuable stock feed, and they also enrich the surface soil with plant food obtained from the subsoil, and with organic matter obtained from the air.

It is advisable to manure these crops, so as to encourage their growth as much as possible, and especially as there is fairly conclusive evidence that if the manure be applied to these crops, it is unnecessary to apply it with the following wheat crop. There need be no fear that the manure will be lost before the wheat crop can use it, for with these crops growing on the land, there is less danger of plant food being washed out by the winter rains than if the land were uncropped.

On fallowed land these crops can be planted with a reasonable amount of certainty, and this year the early harvest affords an opportunity of their very probable success on unfallowed land.

Some growers think that the rest which fallowing entails is beneficial to the land in the same way that sleep is beneficial to animals; and these may fear that cropping in the way suggested will exhaust the ground, and lessen the yield of succeeding crops. Such fears are quite groundless, for it will improve the ground and increase the yield, whilst bare fallowing, though its immediate effect is the production of better crops, really exhausts the soil. One point brought out in a general way by experiment work is that continuous cropping on right lines makes land fertile, whilst injudicious cropping impoverishes the land. There is abundant evidence in this and neighbouring States that the system of cropping recommended is on the right lines.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of January.

Vegetables.

We often have favourable conditions for vegetable growing during January—that is, for summer vegetables—the weather being moist and warm, in some districts very hot, and at the same time weeds grow with extraordinary vigour, and are difficult to cope with, if rain is abundant.

All old vegetable remains, such as pea and bean haulm, cabbage stumps, rotting tomatoes, should be cleared out of the garden; indeed such things should never be allowed to accumulate, for immediately the plants are past their useful stage, they should be removed, and other kinds of vegetables planted in their places, keeping the ground constantly cropped wherever practicable. Always follow one kind of vegetable with another of quite a distinct character, and, where possible, alternate a vegetable which is grown for its leaves or pods with another which is grown for its roots; for instance, a cabbage can be very well followed by red-beet, carrots, turnips, potatoes, and so on; peas and beans can be followed by roots, or by cabbage, cauliflower, &c. Where different kinds of diseases prevail to any extent, such as scab in potatoes, or black spot disease in tomatoes, be sure not to grow such plants on the same ground next year, although other vegetables may be grown in the meantime, for the diseases remain in the ground, in some cases, such as potato-scab disease, for years; and once they become established, they are extremely difficult to eradicate.

If a mulch of dung has been spread between and about vegetables, stir it up occasionally, and stir also the surface of the ground below it as well.

Beans of all sorts, except the Broad or Windsor bean, may be sown during the month as extensively as anyone may require. It is worth while trying several varieties, for there is a very great deal of difference in the quality of the various kinds, both runners and dwarfs. For general purposes the Canadian Wonder holds its own very well for quality as well as productiveness. The bean, although an excellent vegetable, should not be depended upon entirely. The greater variety of vegetables made use of, the better and more wholesome for those who make use of them. An overdose of beans is likely to cause indigestion to some persons.

Broccoli.—A little seed may be sown, from time to time, during the month. This vegetable is hardier than the cauliflower, which it resembles so much, that the two can hardly be distinguished from one another by many persons. It needs rich soil to enable it to grow to perfection. It

should be grown as quickly as possible, and without a check from seed to flower. When the seedlings are 3 or 4 inches or so in height, they should be pricked out in a small bed by themselves a few inches apart, and allowed to grow into good strong little plants. Before they are very large, plant out in a heavily-manured bed—that is, if the ground is not rich enough without the manure; but it is only in very few places that, such as rich alluvial flats, where manure, in more or less quantity, will not be an improvement.

Borecole or Kale.—This is very suitable for cool climates, and is worth growing. It belongs to the cabbage family, and needs the same treatment as broccoli, cauliflower, and cabbage. A little seed may be sown.

Cabbage.—This vegetable is, perhaps, more extensively grown than any other, and is in general favour. It can be cooked in various ways, and it is abused in the cooking, as a rule, probably more than anything else. When sometimes it might be made very palatable, it is cooked in such a manner as to be almost uneatable.

Sow a little seed during the month, and treat as advised for broccoli. During the growth of any of the cabbage family, stir up the ground frequently between the plants; and even when the huge leaves overlap each other, it is possible to get a Dutch hoe underneath.

Cauliflower.—Obtain the best seed procurable, and sow a little in seed-bed, from time to time, shading and watering when necessary. After sowing vegetable seeds of any kind in a seed-bed, never allow the soil to become dry. Spread a mulch, and, if necessary, shade and water frequently.

Cucumber.—If any more cucumber plants are required, seed may be sown, and the chances are, if the season is moist, the plants will soon come into bearing. Check the growth of runners by pinching before the runners extend overmuch.

Celery.—This should grow very well during the month, and be available in sufficient quantity for all requirements, that is, if there should be good rains. Under irrigation it can be grown to great perfection. Sow a little seed, prick out advanced seedlings, and when they are well grown, plant out on ground that has been well manured. Water the plants before and after planting. Celery plants that are nearly full-grown should be "earthed" up. If soil is used for the earthing up, take care that none of it falls in between the leaf stalks.

Cress and Mustard.—These deserve to be grown, for they are very useful for summer; but they will not succeed satisfactorily without a good deal of rain, or frequent supplies of water. The quicker the plants are grown, the more palatable they are likely to be. Sow seed occasionally during the month.

Egg Plant.—These should be bearing well in the early districts, where they are more at home than in cool places. They succeed best in humid climates. In early districts seed may be sown if plants are required.

Maize (Sweet or Sugar).—Plants should be bearing ears sufficiently advanced for use, in suitable districts.

Onion.—A little seed may be sown; but unless the seedlings are kept quite free from weeds when they come up, they are likely to be smothered. Seedlings can be raised in seed-bed and afterwards transplanted when they are strong enough. This is a good method to adopt, and will save a good deal of trouble in early weeding, although the transplanting takes some little time to carry out.

Parsley.—A little seed may be sown.

Peas.—If the weather is satisfactory and the soil is moist, a sowing or two of peas may be made; but, as a rule, the summer is not a satisfactory time for the pea.

Potato.—A few rows may be planted, taking all possible trouble to select good seed, free from any signs of disease such as moth, sometimes known as "potato fly," eel worm, and scab. Discard all potatoes that are in any way defective. Use whole potatoes for seed of medium size. If it is necessary, however, to cut potatoes into sets, select the largest potatoes for the purpose, making use of those of the most perfect shape. Plant in rows about 3 feet apart laying the potatoes 1 foot apart in the rows. The drills should be 5 to 6 inches in depth.

Pumpkins.—Seed may be sown if required, but by this time, plants should be growing and bearing well so that further sowing may be unnecessary.

Radish.—Sow a little seed.

Spinach.—A little seed may be sown from time to time. This vegetable deserves to be grown, being useful for a change from those vegetables most commonly used.

Tomato.—According to Dr. Gordon Stables, R.N., "The tomato if just ripe and not too ripe is perhaps the most health-giving food in the kingdom." Therefore, taking this into consideration, no one could go wrong in planting and using this vegetable extensively. A few seeds may be sown and seedlings planted out in order to keep a supply of fruit going as long as possible. Train to one stem, for, from repeated trials, I feel certain that such system of training is the very best to carry out. Nothing is more offensive than a mass of rotting tomatoes in a garden where the plants have not been trained in any way, and probably nothing is more likely to increase tomato diseases. There is but little trouble in training tomato plants as they should be trained. Stakes must be provided, and as the plants grow they must be tied to the stakes removing all side shoots as soon after they appear as possible. The leaves will spread out well, giving a quite handsome appearance to the plants, and fruit will grow in quantity along the stems.

Turnip.—Sow a little seed in drills from time to time.

Flowers.

Flowers should be abundant in the garden during the month, that is, of course, if the season is favourable. If the weather should prove very dry with hot winds, watering will be necessary, particularly for chrysanthemums and dahlias, the two chief plants which are coming along now for the autumn flowering. Carnations also will need water as well as most of the other garden plants. A thick mulch o dung, if kept sufficiently moist to prevent its being blown away, will prove very beneficial to all plants. Both chrysanthemums and dahlias are likely to be improved by applications of liquid manure occasionally, unless the garden soil is of an exceptionally good character, when water will suffice.

Asters, of the annual varieties, may be planted out in the garden when the weather is suitable and the ground in good order. They are extremely showy plants when in full bloom, and the blooms last for a considerable time.

Roses, grown in pots for the purpose, if not too old, may be planted, and as they will soon establish themselves, they will, if looked after, become fine plants by next spring. If the soil is dry, apply abundance of water to the roses when planted, and keep up the watering from time to time. Also spread a mulch over the ground about the plants.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Dapto, Unanderra, A. and H. Society	Geo. Lindsay	Jan. 8, 9
Albion Park A., H., and I. Society	H. G. Frazer	,, 15, 16
Central Cumberland A. and H. Ass. (Castle Hill)	H. A. Best	,, 22, 23
Gosford A. and H. Association	W. E. Kirkness	,, 24, 25
Kiama Agricultural Association	J. Somerville	,, 25, 27
Coramba P., A., and H. Society	H. Hindmarsh	Feb. 5, 6
Wollongong A., H., and I. Association	J. Beatson	,, 6, 7, 8
Alstonville A. Society	Wm. W. Monaghan	,, 12, 13
Gunning P., A., and I. Society	W. T. Plumb	,, 13, 14
Pambula A., H., and P. Society	J. B. Wilkins	,, 19, 20
Kangaroo Valley A. and H. Association	E. G. Wilkinson	,, 20, 21
Southern New England, Uralla	W. C. McCrossin	,, 25, 26
Campbelltown A., H., and I. Society	A. R. Payten	,, 26, 27
Ulladulla A. and H. Association	C. A. Buchan	,, 26, 27
Robertson A. and H. Association	A. G. Ferguson	,, 27, 28
Manning River A. and H. Association, Taree	S. Whitehead	,, 27, 28
Newcastle A., H., and I. Association	C. W. Donnelly	,, 27, 28, 29
Bega A., P., and H. Society	W. A. Züegel	Mar. 4, 5
Braidwood P., A., and H. Association	L. Chapman	,, 4, 5
Yass P. and A. Association	Will. Thomson	,, 4, 5
Tenterfield P., A., and Mining Society	F. W. Hoskin	,, 4, 5, 6
Berrima A., H., and I. Society, Moss Vale	J. Cullen	,, 5, 6, 7
Wyong Agricultural Association	W. Baldwin	,, 6, 7
Bombala Exhibition Society	W. G. Tweedie	,, 10, 11
Bangalow A. and I. Society	W. H. Reading	,, 10, 11, 12
Glen Innes and Central New England P. and A. Ass.	Geo. A. Priest	,, 10, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12
Nambucca A., H., and I. Association, Bowraville	Clifford Moseley	,, 12, 13
Nepean A., H., and I., Penrith	Percy Smith	,, 12, 13
Port Macquarie and Hastings District A. and H. Soc.	Thos. Dick	,, 12, 13
Blayney A. and P. Association	H. R. Woolley	,, 17, 18
Cobargo A., P., and H. Society	T. Kennelly	,, 18, 19
Macleay A., H., and I. Association, Kempsey	E. Weeks	,, 18, 19, 20
Crookwell A., P., and H. Society	C. T. Clifton	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 24, 25, 26
Tamworth Agricultural Association	J. R. Wood	,, 24, 25, 26
Hunter River A. and H. Association (West Maitland)	C. J. H. King	,, 24 to 27
Moruya A. and P. Society	John Jeffery	,, 25, 26
Orange A. and P. Association	W. Tanner	,, 25, 26, 27
Berry Agricultural Association	A. J. Colley	,, 25, 26, 27
Clarence P. and A. Society, Grafton	Thos. Bawden	Apl. 1, 2

Society.	Secretary.	Date.
Durham A. and H. Association (Dungog)	C. E. Grant ...	Apl. 1, 2
Warialda P. and A. Association	W. B. Geddes ...	,, 1, 2, 3
Bathurst A., H., and P.	W. G. Thompson..	,, 1, 2, 3
Walcha P. and A. Association	S. Hargraves ..	,, 2, 3
Lower Clarence A. Society, Maclean	G. Davis	,, 7, 8
Moree P. and A. Society...	D. E. Kirby ..	,, 7, 8, 9
Mudgee A. Society	H. Lamerton ...	,, 7, 8, 9
Cooma P. and A. Association	C. J. Walmsley ...	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy ...	,, 8, 9, 10
Upper Manning A., P., and H. Ass.	D. Stewart, jun. ...	,, 9, 10
The Royal Agricultural Society of N.S.W.	H. M. Somer ...	,, 14 to 22
The Central Australian P. and A. Ass., Bourke ...	G. W. Tull ...	May 20, 21
Wyngan and District P. and A. Association	R. H. A. Lyne ...	,, 27, 28
Deniliquin P. and A. Society	L. Harrison ...	July 18, 19
Forbes P., A., and H. Association	N. A. Read ...	Aug. 12, 13
Murrumbidgee P. and A. Association	A. F. D. White ...	,, 25, 26, 27
Young P. and A. Association	G. S. Whiteman ..	,, 8, 9, 10
Germanton P. and A. Society	J. Stewart ...	Sept. 9, 10
Cootamundra A., P., H., and I. Association... ...	T. Williams ...	,, 15, 16

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[ADVERTISEMENT.]

Government Stud Bulls available for lease, or for service at State Farms.

Breed.	Name of Bull.	Sire.	Dam.	District where now stationed.	Lease expires
Shorthorn ..	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	*
,, ...	Dora's Boy ...	Cornish Boy ...	Lady Dora .	Berry Stud Farm..	*
,, ...	Royalty ..	Royal Duke II..	Plush ..	Cumbalum ...	30 June, '08.
,, ...	Pansy Duke ...	Earl March ...	Pansy 4th ..	Wollongbar Farm.	*
,, ...	Dora's Showman	Showboy ...	Lady Dora I	,, ...	*
Jersey .	Thessalian II ...	Thessalian ...	Egyptian Princess	Alstonville ...	— June, '08.
,, ...	Colleen's Golden Lad.	Melbourne ...	Colleen ..	Wagga Exp. Farm	*
,, ...	Golden Lord ...	Golden King ...	Colleen ..	,,	*
Guernsey ...	Gentle Prince ...	Rose Prince ...	Gentle ..	Wollongbar Farm	*
,, ..	The Admiral ..	Hawkes Bay ...	Vivid... ..	Gladstone ...	22 Feb., '08.
,, ...	Peter's Lad ..	Peter	Souvenir ..	Burringbar ...	....
,, ..	Saucy Prince ...	Rose Prince ...	Saucy Sal ..	Pambula	— June, '08.
,, ...	Prince Milford..	Rose Prince ..	Flaxy ...	H.A.College, Richmond	*
,, ...	Vivid's Prince ..	Rose Prince ..	Vivid ..	Wollongbar Farm.	*
,, ..	Prince Edward..	Rose Prince ..	Vivid ..	Coraki	21 April, '08.
Red Poll ...	Dairyman .	Dandy	Turban ..	Grafton Farm ...	*
,, ...	The Judge ..	Barrister ..	Lovely 8th ..	Berry Farm ...	*
Ayrshire ...	Don Juan ...	General... ...	Judy 9th ..	Bathurst Farm ...	*
,, ...	Royal Prince ..	Curly Prince ..	Rosie 5th ..	Wollongbar Farm	†
Kerry... ..	Bratha's Boy ...	Aicme Chin ..	Bratha 4th	Glen Innes Farm..	†
Dexter Kerry	Erebus . ..	Hottentot ...	Marguerite ..	Eastwood... ...	26 Mar., '08.
,, ...	Waterville Punch.	....	.. ..	Grafton Farm ...	*
Holstein ...	The Hague ..	President ...	LolkjeVeeman	H.A. College, Richmond	*
,, ...	Obbe II ..	Obbe	La Shrapnel...	Berry Stud Farm..	*

* Available for service only at the Farm where stationed. † Available for lease, or for service at the Farm.

Regulations under which the Government Stud Bulls are leased.

Department of Mines and Agriculture,
Sydney, 1st July, 1903.

1. Any Agricultural Society, Dairy Farmer, or a combination of Dairy Farmers, may, should the Minister deem it advisable, obtain the hire of one of the Government stud bulls for a period of six months if they guarantee payment for the service of thirty cows, or for shorter periods on special terms.

2. The fee, *which shall be payable in advance*, shall be at the rate of 5s. (five shillings) per cow for all bulls save Dexter-Kerries, and their fee shall be at the rate of 2s. 6d. (two shillings and sixpence) per cow. *Bulls will in no case be forwarded until the fees have been received.*

Agricultural Gazette of New South Wales.

Dairy Cattle.

M. A. O'CALLAGHAN.

The Guernsey.

As complete success in dairy farming depends in the first instance on the cattle used therein, it goes without saying that the dairying industry of any country is not on a sound basis unless the class of cattle used therefor are of the required character, and it might also be added that improvement in financial results must depend very greatly on the improvement which is capable of being brought about in cows which any dairy farmer keeps. The price of butter may be a couple of shillings per cwt. dearer one year than another, but that means only a very little all round. If, for instance, we say that butter is worth a farthing nett more one year than another, this only means 3s. 4d. per cow on a returned basis of 160 pounds of butter per cow per year, whereas if, by selection, we improve our cows from 400 to 500 gallons per head per year, it means an improvement in money value of 33s. 4d. per head on the very low valuation of 4d. per gallon for whole new milk. It is thus seen that it is in the increased production from our herds we should devote our greatest energies, until the standard reached is so high that we cannot expect, without great expense, to materially increase it. The yielding of milk in large quantities is really a question of development through selection, and proper handling of the young female, both before and after calving; and there seems no reason why, if sufficient intelligence and energy be devoted to the question, the standard of all dairy cattle could not be raised to, say, 700 gallons of milk or 300 pounds of butter per milking period. Any number of individual cows yield considerably more than this, and the standard mentioned should be within the reach of many. Before, of course, this could be acquired, concentrated efforts sustained over a number of years should be made, and considerable sums of money spent in the selection of animals. If we look back and see to what perfection the modern thoroughbred has been brought for purposes of horse-racing, we will have some idea of what is possible for man to do with regard to the improvement of animals for special purposes. Large sums of money are to be won and great notoriety obtained by the owners of race-horses of the highest class, and hence wonderful improvement has been effected in this animal. If similar efforts were made throughout the world with regard to the development of the dairy cow, there is no doubt but that the averages stated would be obtained before a great many years in those districts throughout the world where dairy farming is

specialised. Though it may not appear so important on the surface as the improvement of the horses, still there seems little doubt but that the annual revenue of a country in which a large section is devoted to dairying, would be increased more by the development and improvement of the dairy cow than of the thoroughbred. When dairying was first begun in New South Wales, those who undertook to carry it on had to do so with whatever cattle were available, and as Australia is looked upon as a pastoral country, it is almost unnecessary to say that the cattle introduced here were selected from herds for beef purposes rather than for the production of large quantities of milk. With only material of this kind in their hands the early pioneers of the industry deserve very great credit for the success which they obtained in producing a cow capable of giving a paying quantity of milk. It is, perhaps, a lucky thing for the dairying industry in New South Wales that the modern Shorthorn had not been developed from a beef point of view to such a success seventy-five years ago as it is to-day, because the foundation of our cattle was undoubtedly of a Shorthorn type. We know that the cattle from which the modern Shorthorn has descended were originally of a heavy milking variety, and as it takes a considerable number of years to cross out milk and cross in beef, there is no doubt that the Shorthorns, which were landed here, say, sixty years ago, were, on the average, more likely to produce milk in quantity than, say, those animals which have been imported for beef purposes within the last thirty years. As the industry developed, however, importations of cattle were made on a small scale, specially for dairy purposes, and thus it is that the Ayrshire and the Jersey were introduced, as well as the Holstein. Bulls, especially of the Ayrshire breed, were mated with Shorthorn cows, and the result was very satisfactory from the dairyman's point of view, because it produced an animal capable of yielding large quantities of milk.

Our development in dairying, however, took place so rapidly that it became impossible for farmers to purchase suitable cattle, in numbers sufficiently large to keep pace with the development generally. Hence, in most districts, with the exception of a few special animals, farmers had to take what they could get, and this meant obtaining animals that were bred almost entirely with a view to a laying on of flesh. Thus it is that the average yield of our cows throughout the State was bound to be a low one, and though it is on the increase, it is still capable of great improvement, without the expenditure of any considerable amount of brains or money.

It is now a generally understood fact that the bull, if pure bred, has a very great effect on the milking properties of his progeny, no matter what class of cattle they are. For this reason it is evident that the first steps towards improving the milk yields of the cattle of any district should be to procure bulls of the character best calculated to bring about the desired results. The question of which breed is not of so much moment as the individuality of the animal. Excellent specimens may be obtained from many of the recognised dairy breeds, which when crossed on to ordinary half-bred cattle,

will be capable of stamping his type on a very high percentage of his calves. The farmer should, however, first make up his mind as to the breed of animal calculated to suit his soil, climate, and class of farming; and, having fixed this, should stick to bulls of that breed for three generations of animals at least. By that time his cattle will have, practically speaking, all the chief characteristics of the breed which he has selected his bulls from. If all heifer calves are kept from the best milkers, and their bringing up has been properly attended to, he will, in a few years, have considerably increased the butter yield per head of his herd.

Government Bulls for the use of Farmers.

For the purpose of demonstrating this fact, and thereby educating the farmers on the point, as well as, of course, to generally improve our dairy stock, the Government of this State decided to import a number of cattle in 1898, and lease a number of the bulls to farmers, as well as establishing the stud farm where young bulls would be raised, to be sold at reasonable prices afterwards to *bonâ fide* dairy farmers. At first the experiment was voted as injudicious, mainly by those who were interested or prejudiced, but when it was seen that the imported bulls produced an improvement in the cattle with which they had been mated, the desire to lease them became very strong, and, of course, only a very small percentage of those making request to do so could be accommodated. The result of the experiment for education purposes, however, had been very valuable; and instead of the farmer being prepared to use the first bull that he came across, the intelligent farmers now demand pure-bred animals, no matter what breed they desire, so that with this feeling abroad we are assured of a general improvement in our dairy stock for some time to come. No greater evidence of this can be got than the fact that many of our farmers have recently imported cattle from England on their own account, for the purpose of breeding bulls and improving their own stock.

Breeds of Cattle.

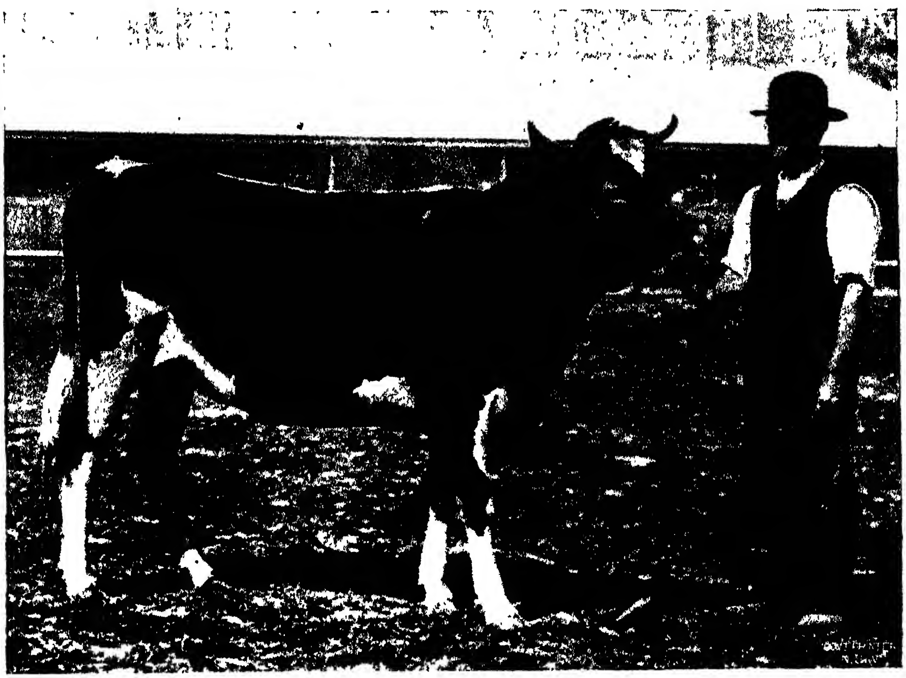
We have in New South Wales all varieties of climate and soil, speaking in a general way, and for this reason there is a demand for different breeds of cattle suitable to the conditions under which they are required to be used. We have also the different branches of dairying, viz.:—the selling of milk, for consumption as milk, the manufacture of butter, the manufacture of cheese, as well as in a smaller way the manufacture of condensed milk; and, because of these varieties of purposes, there is a demand for special cows for cheesemaking, for butter-making, and for the production of milk for sale as milk. Besides the well-known strain of Shorthorn already referred to, we have the Ayrshire, the Jersey, the Holstein, the Guernsey, and the Kerry now established in this State.

The Guernsey.

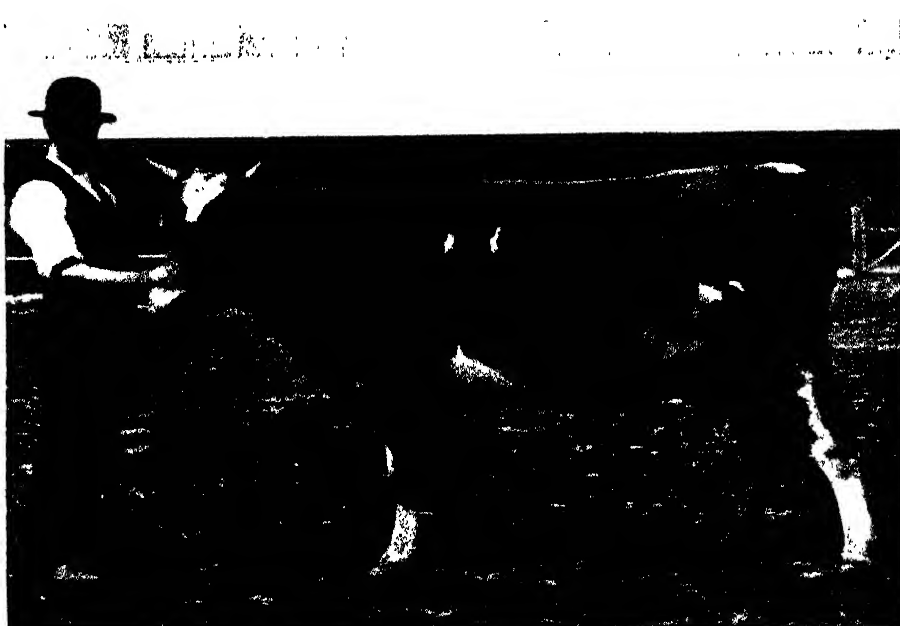
Of all the breeds of cattle imported in 1898, none has given so much satisfaction to farmers apparently as the Guernsey, and judging by results obtained by crossing with the ordinary cattle, the confidence of the farmers is fully justified. The desire to purchase or lease bulls of this breed has been very pressing now for some years, but owing to the limited number of cows originally imported, the Government were only able to supply a very small percentage of the demands made for young bulls. Matters, however, have now been considerably improved from the farmer's point of view, the late Minister for Agriculture, The Hon. S. W. Moore, and the late Premier, The Hon. J. H. Carruthers, having arranged for an importation of twenty Guernsey females for the purpose of breeding bulls to meet requirements of dairy farmers. These animals, which are undoubtedly a great acquisition to the State, have now been landed, and photographs are given herewith of some of them.

Head of No. 2 (Clatford Hopeful).

No. 3.—Parson's Red Rose 2nd.



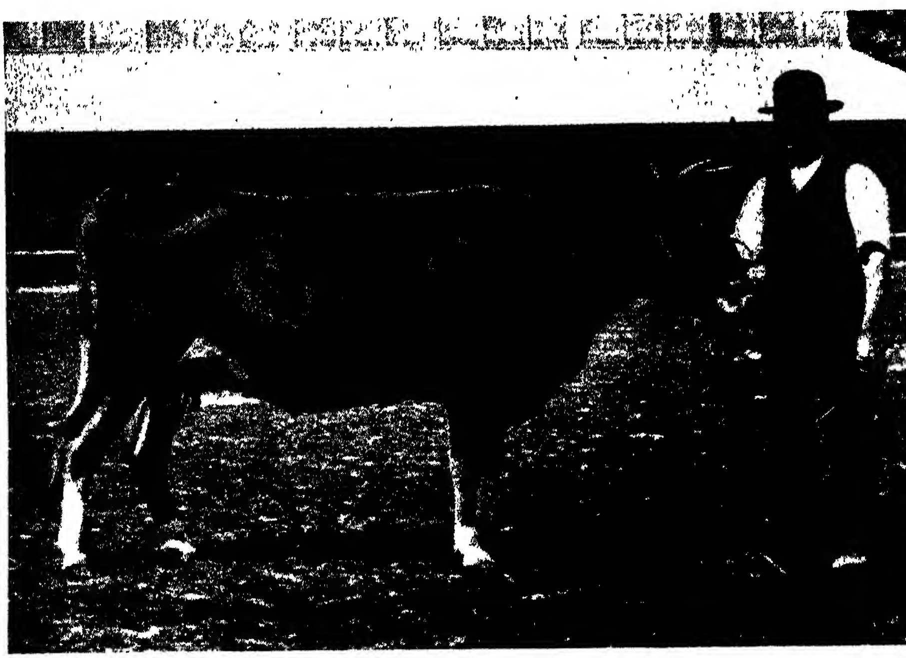
No. 5. Claudia's Pride (Heifer).



No. 6.—Bijou de la Fontaine 3rd.

The photograph of No. 3 represents "Parson's Red Rose 2nd," calved on the 26th January, 1906. She was bred by A. Parsons, Castel, Guernsey, and her sire is "Gil Blas" (1,679 P.S.R.G.A.S.); and her dam, "Parsons' Red Rose" (2,813 F.S.R.G.A.S.). She is a nice heifer, showing a good deal of quality, and is now at the Wollongbar Experimental Farm.

No. 5 is the heifer "Claudia's Pride," who obtained second prize in her class at the last Royal Show of England, so that she must rank as an animal of class. She shows good milking capacity, and is of a very rich and fashionable colour, with grand skin. Her head is very handsome, the fault, if any, being that she is slightly short and thick in the neck, but as she develops into a cow I expect her to fine down there. She is stationed at the Berry



No. 7.—Golden May of the Gron 3rd.

Stud Farm. She was born on 24th April, 1906, and was bred by Mrs. H. C. Stephens, Salisbury; and her sire is "Permit" (1,407, E.G.H.B.); and her dam, "Itchen Claudia" (5,152, E.G.H.B.)

No. 6 represents "Bijou de la Fontaine 3rd," a cow of wonderful substance and constitution, in fact she is too strongly constituted for a typical Guernsey. However, I expect to see her put up good dairy records, and she should produce animals of a type calculated to do benefit to the breed in New South Wales. She is stationed at Wollongbar Experimental Farm. She was born on 21st December, 1902, and bred by Mrs. H. C. Stephens, Salisbury; and her sire, "Cholderton Lord Roberts" (1,272, E.G.H.B.); and her dam "Bijou de la Fontaine" (3,976, E.G.H.B.).

No. 9.—Hayes' Lily du Preel 4th.

No. 10.—Rosey 7th.

No. 7, "Golden May of the Gron 3rd," is another cow that has been sent to Wollongbar Experimental Farm. She was born on 8th October, 1904, and was bred by Col. H. W. Shakerley, Godalming. Her sire is "Burgate Holden" (1,358, E.G.H.B.); and her dam, "Golden May of the Gron" (5,119, E.G.H.B.). She is a cow just at the end of her milk and not at the present time in her very best condition, but is very typical of the breed.

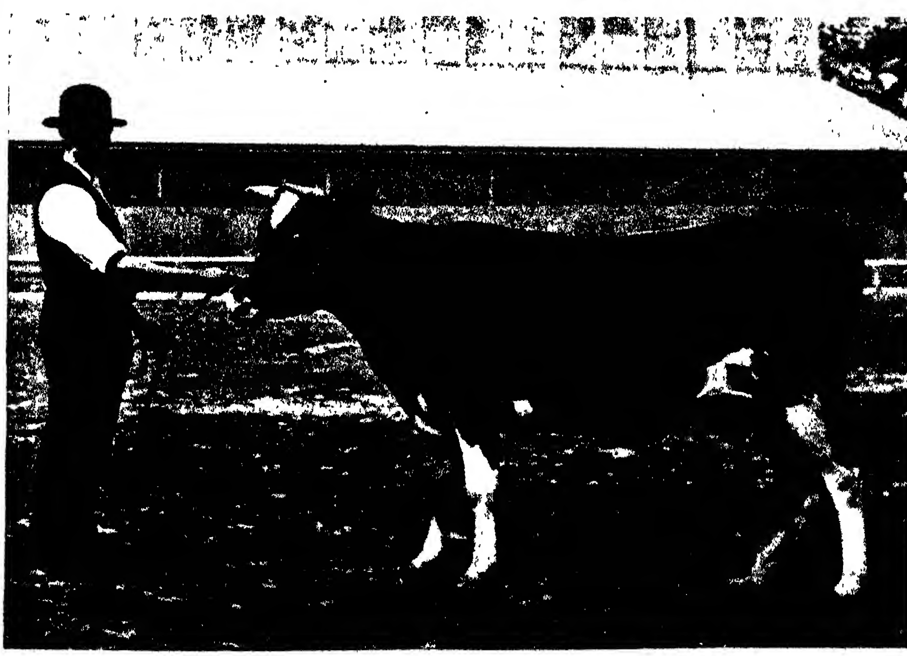
No. 8 represents a very nice heifer indeed, "Hayes' Muzette 7th." She was born on 3rd March, 1906, and was bred by E. A. Hambro, Kent. Her sire is "V.C." (1,729, E.G.H.B.); and her dam, "Hayes' Muzette 2nd" (4,090, E.G.H.B.). She is stationed at the Berry Stud Farm.

No. 11.—Rosey 8th.

No. 9, "Hayes' Lily du Preel 4th," is a heifer by the same breeder as No. 8. She is also a handsome young beast, and has been sent to Wollongbar Farm. She was born on 7th April, 1906, and bred by E. A. Hambro, Kent; and her sire is "Hayes' Royal" (1,674, E.G.H.B.); and her dam, "Hayes' Lily du Preel 3rd" (6,166, E.G.H.B.).

No. 10, "Rosey 7th," represents probably one of the most typical Guernseys imported, as well as one showing very excellent dairy qualities. She represents a notorious strain of Guernsey blood, her dam being a well known animal, who is now about 19 years of age. She was born on 4th September, 1904, and was bred by The Rt. Hon. J. E. Ellis, M.P., Yorkshire. Her sire is "Broomflower" (1,446, E.G.H.B.); and her dam, "Rosey" (2,308, E.G.H.B.). She was much admired when sent to the Wollongbar Farm.

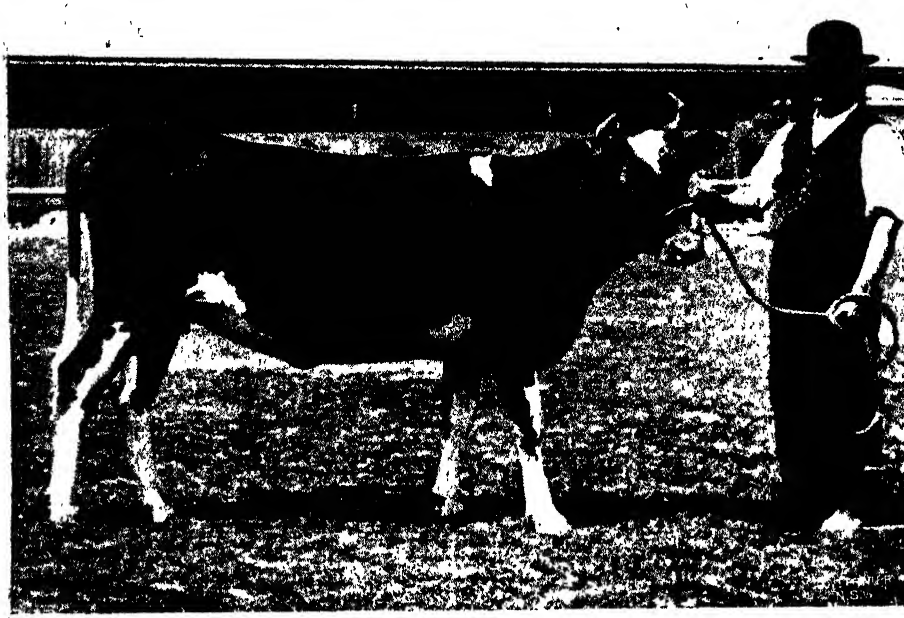
No. 12.—Rohais Lassie.



No. 15.—Bel Air VI.

No. 11, "Rosey 8th," is related to No. 10, being a year younger, and directly descended from the well-known cow "Rosey." She was born on 10th September, 1905, and bred by The Rt. Hon. J. E. Ellis, Yorkshire. Her sire is "Broomflower 2nd" (1,641, E.G.H.B.); and her dam, "Rosey 3rd" (3,912, E.G.H.B.). She has been sent to Berry Stud Farm.

No. 12, "Rohais Lassie," is an island-bred heifer just over 2 years old. She has plenty of quality, and should develop into a very fair cow. She was born on 24th October, 1905, and was bred by F. Belloir, Guernsey. Her sire is "King of the Friquet" (1,674, P.S.R.G.A.S.); and her dam, "Dolly Gray" (5,337, P.S.).



No. 16. Beauty V of the Brickfield.

No. 15, "Bel Air VI," is an island-bred cow. She is now at the end of her milk, and was born on 21st February, 1905, and bred by T. H. Mahy, Guernsey. Her sire is "Sequel's Crescendo" (1,406, P.S.); and her dam, "Bel Air IV" (5,809, P.S.). She is stationed at Berry Stud Farm.

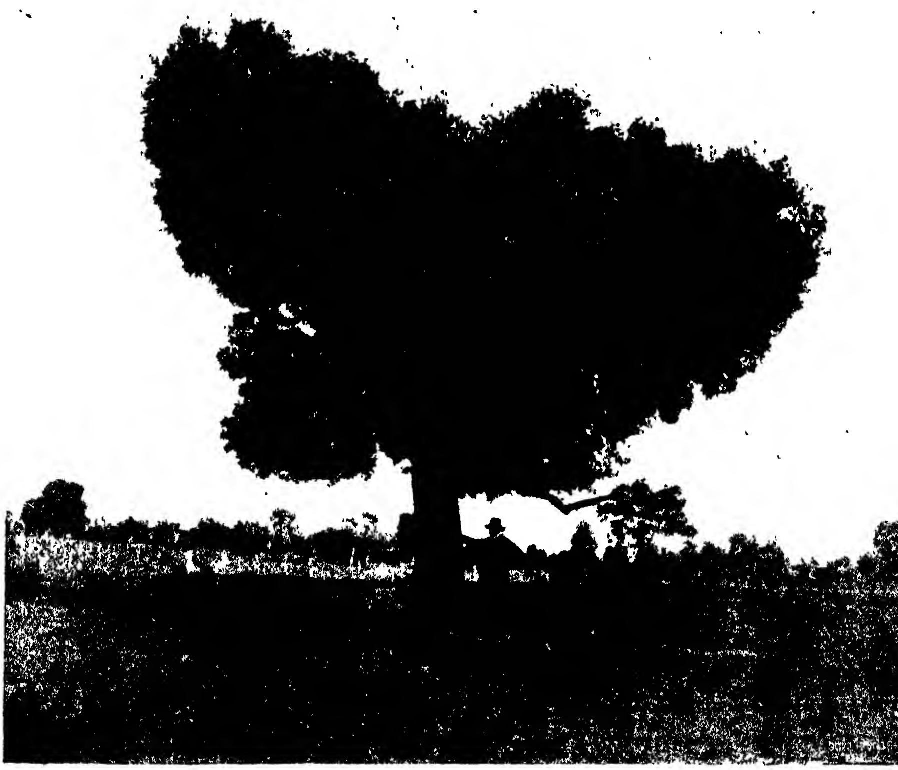
No. 16, "Beauty V of the Brickfield," is an island-bred cow, just 4 years old, and at the end of her milk. She was born on 4th November, 1904, and bred by J. de Garis, Guernsey, and her sire is "Mino" (1,415, P.S.); and her dam, "Beauty I of the Brickfield" (4,859, P.S.). She has been sent to the Wollongbar Farm.

[The numbers 2 to 16 refer to the numbers cut on the horns before being shipped from England.]

Edible Trees and Shrubs.

R. W. PEACOCK.

PERHAPS the most striking feature of the Flora of the central portion of Australia is the large proportion of trees and shrubs which are edible. In the western districts of New South Wales, where the rainfall is meagre and subject to prolonged periods of dry weather, these trees and shrubs are of



Kurrajong (*Sterculia diversifolia*), G. Don.

peculiar value. Their drought resistance is remarkable. They being evolved under droughty conditions possess characteristics which allow of development under adverse conditions. For example: the root system of the kurrajong allows of plant-food being stored in tuberous-like sections, which is drawn upon in dry years. The harsh narrow phyllodia or leaves of the acacias present the least transpiring surfaces to the hot rays of the sun. They also are attached vertically and throw the least possible shadow. The

currant bush divests itself of its leaves under adverse conditions, they only appearing in quantity in the best of seasons. The stems at other times function as leaves. Such characteristics fit them admirably for their environment.

The value of these trees and shrubs has been fully demonstrated throughout the extreme drought of 1902 and preceding lean years. Many thousands of sheep and cattle subsisted solely upon them for considerably over twelve months. Sheep have been fed for several years upon trees alone, and kept

Needlewood (*Hakea leucoptera*), R.Br.

in fair condition. Cattle have fattened upon some of the best of these trees. They are practically useless for horses. Goats thrive upon them. Cows milk fairly well and produce good flavored butter upon a tree diet. Working bullocks pull heavy loads and work hard at sinking tanks for water, when they can obtain nothing else. Camels prefer nothing better. Rabbits are far too fond of many of the best varieties, and have done much towards their annihilation. Such is regrettable, and if unchecked, these in conjunction with overstocking with sheep, must eventually alter the nature of the western flora for the worse.

Many varieties are well nigh extinct over many tracts upon which they at one time were plentiful. Owing to the injudicious system of felling, instead of lopping, many of our mulga scrubs have been destroyed. The same applies to other trees. Overstocking, or even rational stocking, prevents the growth of seedlings to take the place of the older growths.

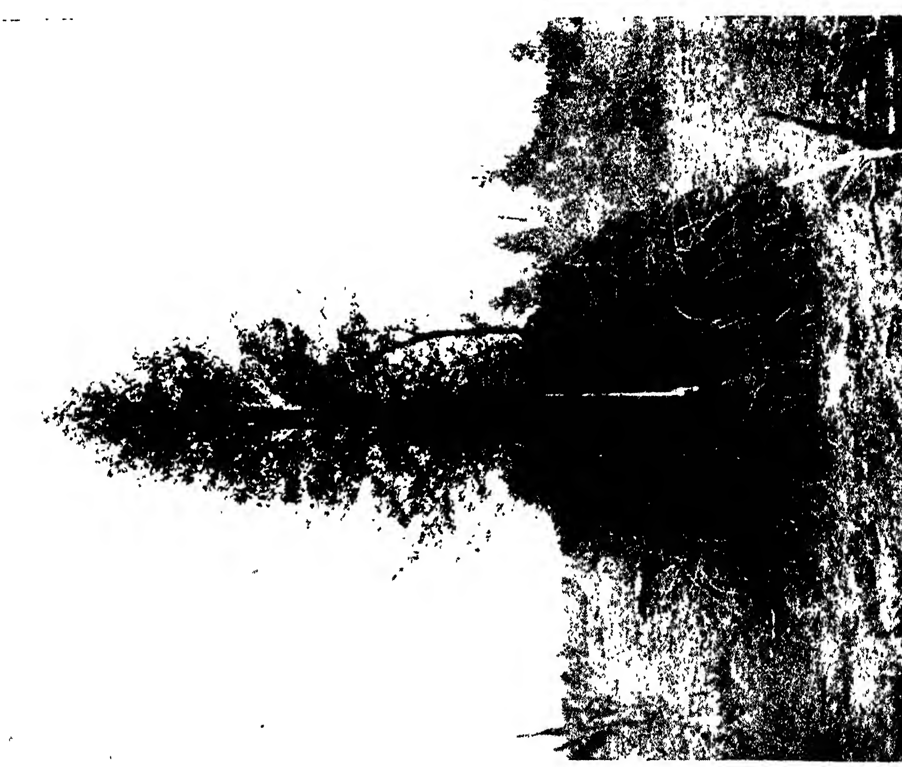
Owing to the rabbits the conservation of these valuable plants is fraught with many difficulties. The loss of such during the next drought will be keenly felt. Nature may evolve something to fill the breach. At present

Supple Jack (*Ventilago Viminalis*), Hook.

the outlook is not very encouraging. In order to facilitate the gaining of information respecting them, the plates of several are shown, and these notes are supplementary of those appearing in the *Agricultural Gazette* of April, 1899.

The brigalow, ironwood, and yarren cannot be classed as edible. The gidyea is eaten by the camel. Sheep have been known to eat some of the eucalpyts, and also pine scrub when hard pressed. Such are not comparable to those shown, of which many are relished by stock, and they unquestionably thrive upon them.

Ironwood (*Acacia excelsa*).



Leopard Tree (*Flindersia maculosa*) F.v.M.

Currant-bush (*Apophyllum anomalum*), F.v.M.

Willow-like Acacia (*Acacia salicina*), Lindl.

Quinine Tree (*Alstonia constricta*).

Gidyea (*Acacia homalophylla*), Cunn.

Wild Lemon (*Canthium oleifolium*), Hook.

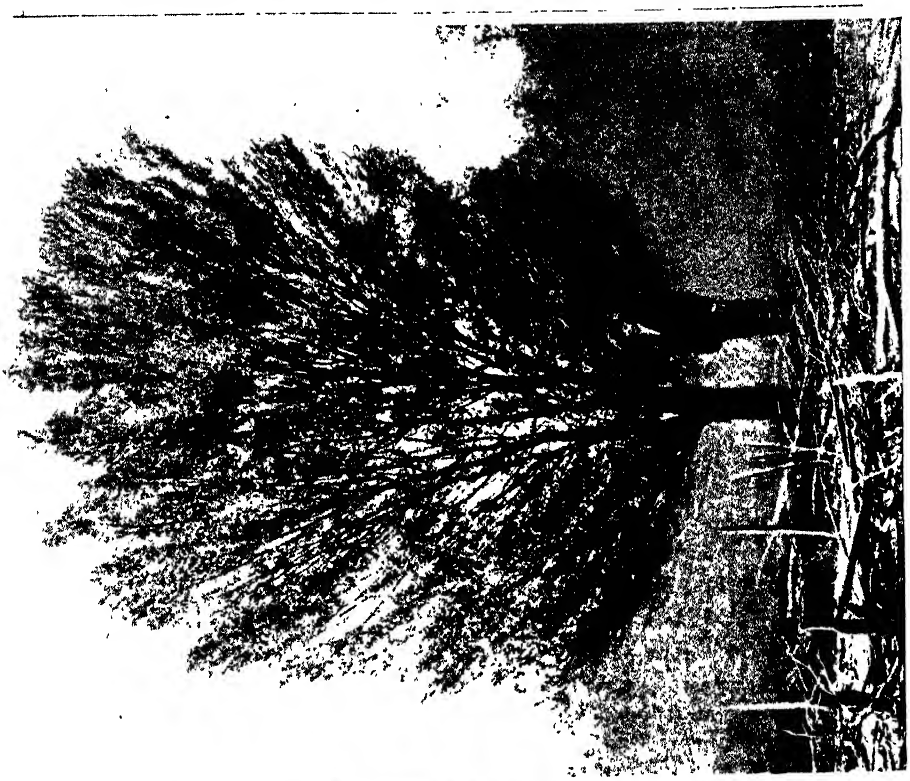
Wilga (*Geijera parviflora*), Lindl.

Currawang (*Acacia doratoxylon*), Cunn.

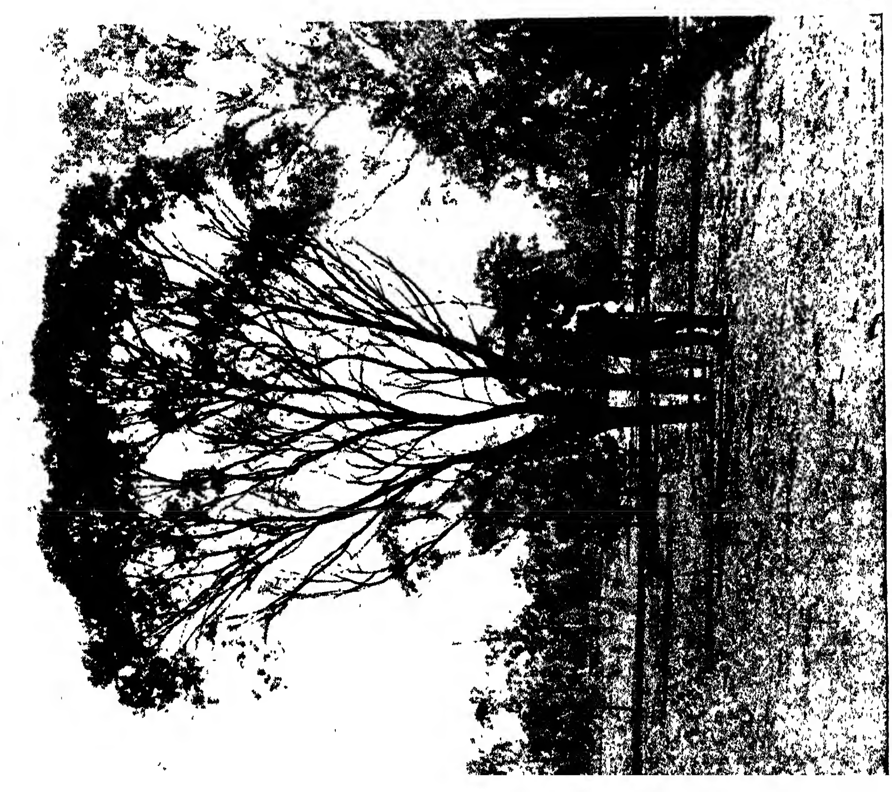
Beef-wood (*Grevillea striata*) R.Br.

Emu bush or Berrigan (*Eremophila longifolia*), F.v.M.

Brigalow (*Acacia harpophylla*).



Mulga (*Acacia aneura*), F.v.M.



Yarron (*Acacia sp*).

Warrior bush (*Eremophila polyclada*), F v M

Quandong (*Fusanus acuminatus*), R Br

Belar (*Casuarina glauca*), Sieb.

Lyonsia eucalyptifolia, F.v.M. A vine supported by dead tree.

Orange Bush (*Capparis Mitchelli*), Lindl

Narrow-leaved Apple-tree (*Angophora intermedia*), DC.

Myall (*Acacia pendula*), Cunn.

White-wood (*Atalaya hemiglauca*), F.v.M.

Hawkesbury Agricultural College and Experimental Farm.

Grasses at the Hawkesbury Agricultural College.

A. H. E. McDONALD,
Experimentalist.

Experiments have been conducted at the College for some years with a large number of grasses and forage plants, and close observations made of the characteristics and habits of the different varieties, with a view to selecting, if possible, those which will prove satisfactory under our conditions. Owing to the uncertain nature of the climate, and its dissimilarity to that of older-established countries, we can gain little from their experience, and have to depend largely on our own research work to guide us in selecting varieties and methods for the formation of pasture land. Until recent years, with the exception of the more favoured coastal districts, this important branch of farm operations had received little attention; but with the increase in land values and in the number of small farms, the necessity of obtaining the highest returns from the land has become greater, and more attention is now being paid to it. The spread of dairying has tended still further to create a desire for better pastures, and in consequence keen inquiries are now being made for suitable grasses. It is in satisfying these demands that the experimental work is proving useful. The years during which it has been carried out have, generally speaking, been remarkable for the low annual rainfall compared with the average, and the results give a pretty clear indication of the value of the grasses under somewhat adverse conditions. It has been the aim to contrast with the better-known varieties—native and introduced grasses—which might be expected to prove of value. Whilst it has not been possible to carry out the tests under the conditions which would prevail in paddocks grazed by stock, the method of comparison adopted allows of fairly accurate estimates of the usefulness of the different grasses. Special attention has been paid to those likely to prove suitable for dry conditions, as it is from the inland districts that the keenest inquiries come, and it is in those districts that the greatest difficulty is encountered in establishing pastures. Attempts that have been made in such places have in many cases been followed by indifferent success, and have to a certain extent given rise to an impression that good results cannot be obtained from artificial grasses. This is no doubt true of some varieties; but from the results of work here we can point to several kinds which are likely to give good returns, provided they receive fair treatment. The mistake is often made when sowing new grasses in supposing them to possess some magical power which enables them to resist all

circumstances. Roots or seed are simply planted or sown in paddocks, and left to take their chance with other well-established grasses. Cattle are grazed upon them, and when they fail to grow surprise is expressed. Such new grasses, being sweet and tempting to stock, are kept eaten down too closely, and are consequently soon eaten right out. Any attention grass land receives is well deserved, and will be followed by satisfactory increases in its carrying capacity. When once established it lasts years; but it must be well treated at the commencement, and encouraged to get its roots well down into the soil, or it will never thrive.

In such a country as this, where farming is practically in its infancy, everyone must depend much on his own resources and experience for success. If each individual landholder carried out a few tests with some of the best grasses, it would prove of great assistance in showing the most valuable sorts for his particular district. All grasses have particular characteristics, such as preference for different classes of soil, temperature, &c., and it may be found that some which do well in one place cannot thrive in others. By this simple form of experimenting the best could soon be selected, and much expense and disappointment avoided, than if varieties were planted of which the farmer had no practical experience.

Introduced Grasses.

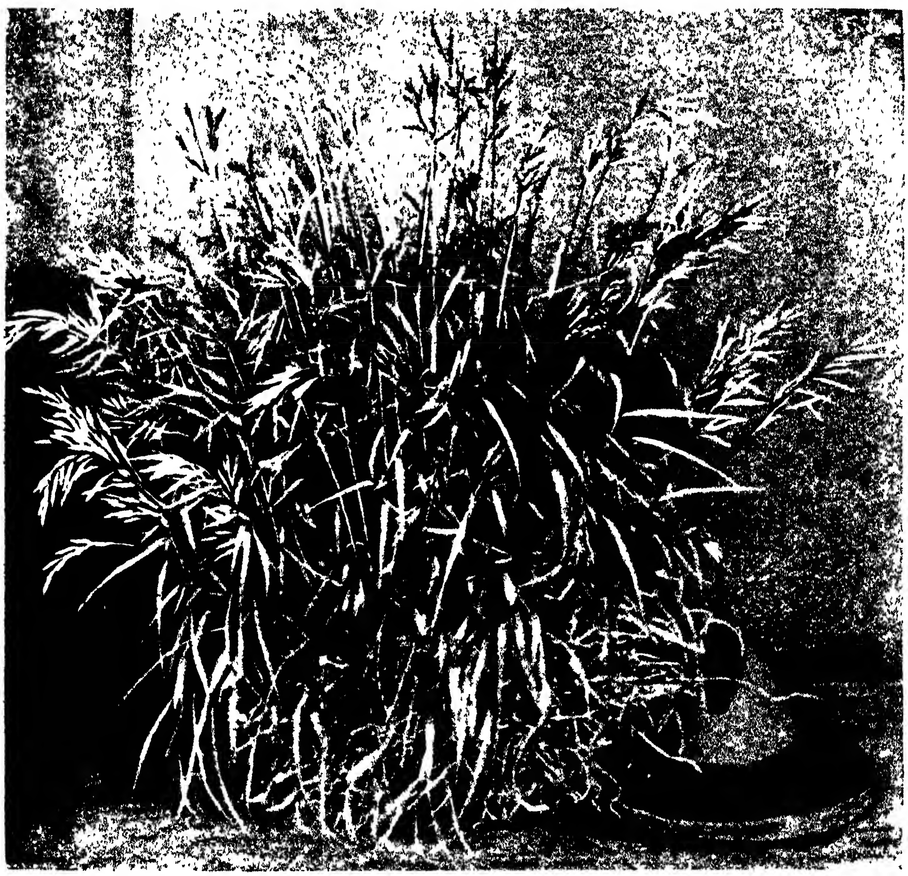
Meadow Foxtail (*Alopecurus pratensis*).—This quick grower comes early in the spring, and provides a good bite of fodder when other grasses are scarce. It grows to a height of 18 inches to 2 feet, and is fine and succulent in the stem and leaf. It does not give a heavy yield, but is highly fattening, and is also valuable in pastures on account of its earliness. After flowering in October, it gradually dies down, and produces no fresh growth until the cool weather of autumn returns. Stock of all kinds relish it.

Bent Grass (*Agrostis stolonifera*).—Grows slowly during the spring and early summer months, and flowers in November. It attains a height of 12 inches, and remains green and succulent throughout the summer, but is not a heavy yielder. Its stoloniferous roots give it the power of quickly forming a close sward. It is a useful grass for cool, moist climates.

Blue Grama Grass (*Bouteloua oligostachya*).—This grass is deep rooting, and when sown thickly forms a dense mass of herbage about 18 inches high. The stems and leaves are fine and succulent, and have a characteristic bluish tinge. It resists drought well, and is likely to prove useful in the drier districts as a pasture grass. It begins to flower in November, but remains green until February or March, when it dies back, and does not make fresh growth until the following spring.

Prairie Grass (*Bromus unioloides*).—This is a very vigorous winter and spring grass, which seems to do well in almost all soils and climates. It attains a height of 3 to 4 feet generally, but has grown 8 feet high in rich moist soil. The seed is produced in large quantities, and germinates freely. The first growth is made in the autumn and early winter months,

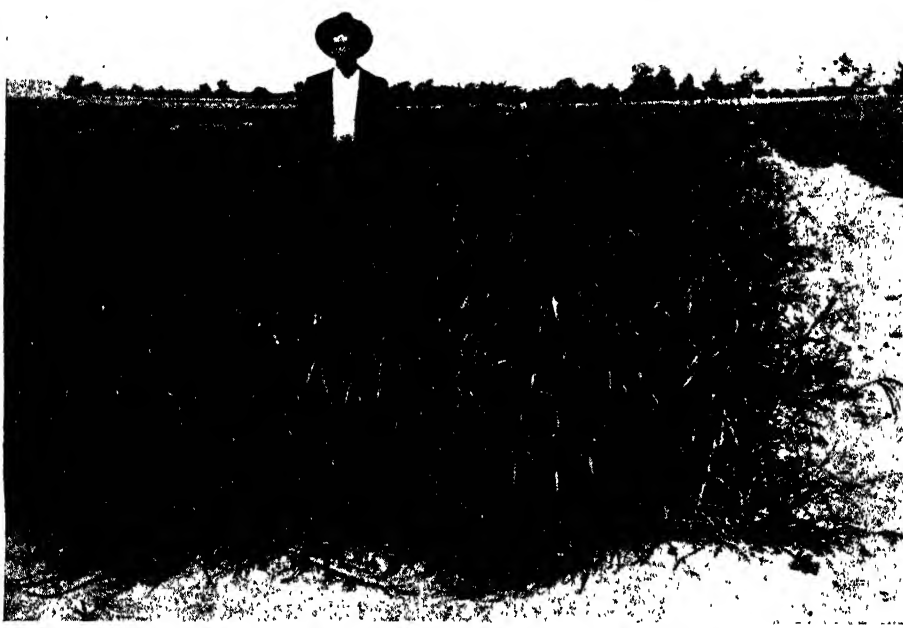
and remains green almost up to December. Stock of all kinds eat it greedily, and it forms a highly nutritious fodder either in the green state or made into hay. Owing to the ease with which it is cut, and the heavy yield, it is very useful for the latter purpose. It does well, and spreads rapidly on old cultivated ground. Some care is necessary in grazing it to see that it is not eaten down too closely, as stock are so fond of it that they eat the crowns right out, and consequently it dies out; it is one of the best winter grasses.



Awnless Brome Grass (*Bromus inermis*).

Awnless Brome Grass (*Bromus inermis*).—This hardy grass appears to resist drought and frost equally well, and remains green practically throughout the year. It tillers freely, and produces dense tufts of succulent foliage. The flowering stems are produced in October; but here, perhaps owing to the peculiar nature of the past season, no seed was formed. It possesses a mass of fibrous roots, which, extending deep into the soil, enable it to produce large quantities of feed on even poor soil. It is liked by all classes of stock.

Rhodes Grass (*Chloris Gayana* var.).—This grass, although only introduced into the State comparatively recently, has spread rapidly, and is now well known. The reasons for its rapid rise into favour are its wonderful power of returning large yields of fodder when grown on poor soil, and its power of resisting drought. *Paspalum dilatatum* has long enjoyed a reputation for productiveness; but the essential conditions for success with it are a fairly rich soil and a regular rainfall, and where these are absent it does not always thrive. Rhodes Grass fills the gap, and probably no other grass will give such good results under adverse conditions of soil and climate. It is particularly suited for light, sandy soils; but also thrives in even heavy clays. It does not stand frost well, and is cut down



Rhodes Grass (*Chloris Gayana* var.), four months after sowing.

in the winter, but grows rapidly in the spring, and attains a height of 3 to 4 feet. In experiments at the College it has yielded up to 12 tons of green forage per acre. The stems are fine, and in their early stages succulent; but if not kept closely grazed or cut before the seed hardens, it becomes a little coarse and harsh. The feeding value is high, and it is relished by all classes of stock. The stems in the early stages of their growth are procumbent, and as they root at every node, fresh centres of growth are being constantly formed, and the ground is quickly covered with a dense sward. When the flowering is about to occur, in November or December, the stems grow upright rapidly, and if it is desired to make it into hay, no difficulty is found in cutting it at this time. It is likely that it will become popular for hay and ensilage, owing to its

heavy growth and the ease with which it is harvested. After cutting, a second growth is made, and gives good grazing. The seed is formed freely, and is easy to harvest, but shakes out almost as soon as it ripens, and a certain amount is always lost in the field. The harvesting should be done when the largest quantity can be obtained, and a careful watch must be kept to select this time. It can best be done by using a sickle, and cutting only the heads. This is rapidly done, and the heads are then dried on clean floors or cloths for a few days, when the seed can be shaken out without beating or threshing. Many inquiries have been made whether this grass would be difficult to eradicate after it has become established. It is not likely that it will ever present any difficulty, as the roots are fibrous, and the plants can easily be ploughed out of the ground.

Crested Dogstail (*Cynosurus cristatus*).—This grass forms dense tufts of a soft velvety nature, but rarely grows to a height of more than a few inches. It is useful for giving a bottom to other tall grasses, and does well on poor soils. It is a good fodder, but is more fitted for sheep than large stock. It keeps green almost throughout the year.

Cocksfoot, Orchard Grass (*Dactylis glomerata*).—This grass prefers strong land, and although it requires plenty of moisture for its best development, it resists drought fairly well. It flowers in November. During the hot weather of January it dies down, unless the soil is moist, and becomes green again in the autumn. A good body of foliage is produced, which is suitable for either pasturage or hay. The stems become somewhat harsh with age, and it needs to be grazed moderately close.

Diplachne sp.—Attains a height of 2 feet 6 inches, and gives a good succulent forage. The stems die down after flowering in November; but the leaves at the base remain green until frosts set in. The seed is produced in large quantities, and germinates freely. The plants tiller well, and fairly large tufts are formed. It can be used for pasture, or hay, and can be easily cut.

Tall Fescue (*Festuca elatior*).—Grows to a height of 4 to 5 feet, and produces a large body of forage, which, however, is rather coarse in character. The plants tiller well, and form dense upright tufts. Its deep-rooting system enables it to resist drought and do well on poor soil. Frosts have little effect on it, and a vigorous growth is maintained during the greater part of the year.

Giant Fescue (*Festuca sp.*)—This grass grows to an immense size, the stems often measuring over 7 feet in height, and the tufts 3 to 4 feet in diameter. The leaves grow to a length of 3 to 4 feet, and are very broad. When in the full vigour of its growth it presents a very striking appearance. The forage produced is rather hard and coarse in character, and does not possess a good flavour. It resists drought well, and remains green during the whole year, with the exception of the hottest months. It is only suitable for ensilage and rough feed.

Perennial Rye Grass (*Lolium perenne*).—This grass requires a fairly good soil and an evenly distributed rainfall. Under these conditions it

has proved one of the most valuable grasses for either pasturage or hay; but in a dry climate or in poor soil it is out of its proper sphere, and will not give satisfactory results. Under favourable conditions the plants tiller out close to the ground, a dense sward is formed, and a heavy mass of highly nutritive herbage produced, which is relished by all classes of stock. In our experiments with it a fair growth is obtained in the early spring months and in late autumn; but during the hot weather of summer it suffers severely, and almost dies out.

Italian Rye Grass (*Lolium italicum*).—The remarks made on Perennial Rye Grass apply to this variety, with the exception that it is slightly more drought-resistant, but is not so permanent in character.

Little Millet (*Milium multiflorum*).—Attains a height of 3 feet, and produces a large quantity of herbage, which remains green during a considerable portion of the year. It resists drought well, and gives good results in even dry seasons. It is a good hay grass; but if left standing after it flowers, in November, becomes woody in the stem. It does well on poor sandy soil, and makes several growths during the year. Large quantities of seed are produced.

Paspalum dilatatum.—This grass is now so well known that any mention of it may seem superfluous; but it may be as well to give a few notes in order that a comparison with other grasses can be made, and a better relative idea of their value obtained. Our experience with it has been of a mixed kind. In moist seasons it gives wonderful returns of nutritive herbage, which stock eat greedily; but in dry seasons it makes little growth, and spreads slowly. It requires an abundant rainfall and a fairly warm climate for its best development. Given these conditions, no grass will equal it; and, in fact, the growth is so heavy that at times stock are unable to keep it down, and it becomes coarse and unpalatable, especially in the latter part of the season. Frosts cut off the upper leaves, and although the grass beneath this coat of dry matter remains green during the winter, it is unpalatable to stock, and they refuse to eat it. Under circumstances such as these the value of the grass can be greatly improved by cutting in February or early in March, and making the crop into hay or ensilage. This allows of a fresh shoot; and although frosts cut it back, it has a good feeding value. This cutting also prevents largely the tendency the grass has to become coarse after it has been established some years.

Hairy Paspalum (*Paspalum virgatum*).—Grows to a height of 7 feet 6 inches, and flowers in November. The plants tiller well, and it spreads rapidly from the parent stem, forming dense tufts. Seed is produced abundantly, and germinates easily. The character of growth is upright, and an immense bulk of foliage is produced. The stems are somewhat coarse, but carry many large leaves, which are fairly soft and palatable to stock. It grows well in poor sandy soil, but does not seem to possess any advantage over *Paspalum dilatatum*, except its upright nature.

Paspalum paniculatum.—Attains a height of 18 inches, and flowers in December. It grows in tufts, and is not very vigorous. The foliage remains green during a great part of the year, and is tender, but somewhat hairy.

Panicum proliferum.—This is essentially a summer grass. It grows rapidly during the spring and early summer, and produces a fair amount of herbage. The flowering occurs in November, and after this it quickly becomes dry, and makes no fresh growth until the following spring.

Evergreen Meadow Grass (*Poa sempervirens*).—This variety enjoys the reputation of being one of the richest of the cultivated grasses. It is creeping in habit, and forms a dense turf, but requires a moist climate. Frosts affect it very little, and it maintains a green growth through the winter, until hot weather sets in, when it dries off rapidly. In our trials it has never given large yields.

Natal Red Top (*Tricholæna rosea*).

Texas Blue Grass (*Poa arachnifera*).—This is one of the most valuable grasses in our collection. It resists drought and frost well, and produces a dense mass of foliage up to 2 feet high, which is highly nutritious. Frosts affect it little, and good pasturage is obtained from it throughout the winter and well into summer. The hot weather of January and February dries it off a little; but it starts into growth again as soon as the cooler days return. It possesses a deep-rooting system, which enables it to do well on even poor soil. Once planted, it spreads rapidly, and

forms a dense turf. In our trials its fine healthy appearance during the cold months rendered it very conspicuous.

Kentucky Blue Grass (*Poa pratensis*).—The stoloniferous roots of this grass allow it to spread rapidly. It resists frosts well, and produces good feed during the winter and early spring. It does not stand drought or heat well, and under such conditions gives only small yields. It is nutritious, and liked by stock; and as it is early, is valuable for cold climates.

Natal Red Top (*Tricholaena rosea*).—This is a very striking grass, its highly-coloured appearance when in flower making it very handsome, and it is on this account a favourite grass for pleasure grounds. It is a vigorous grower, and attains a height of 3 feet 6 inches. A dense mass of leafy, succulent herbage is quickly produced in spring, and remains until cut down by heavy frosts. It flowers in November and December, and produces a large amount of seed, which germinates freely. It resists drought well, and flourishes in poor sandy soil. For growing as green food for poultry it is very valuable, and can be recommended for sowing in fowl-yards which require resting.

Sporobolus airoides.—A fairly rapid-growing, tall grass, attaining a height of 3 feet. It flowers in November, and after this dies down until the following spring, when it makes a fresh growth. The herbage it produces is succulent and very suitable for hay.

Panicum laevifolium.—Attains a height of 2 feet, and flowers in November. It is a quick-growing grass, but somewhat watery in nature, and is apparently more suited to a moist climate than dry conditions. After flowering it rapidly dries, and does not make a fresh growth until the following spring.

Panicum bulbosum.—This upright-growing grass flowers in November, attaining a height of 2½ to 3 feet, but is only sparsely covered with leaves. The forage it produces is succulent and palatable, but becomes dry shortly after the flowering. It is a good drought resister, and does well in sandy soil.

Native Varieties.

In the selection of grasses, our own native varieties are worthy of careful consideration. They have become adapted, by long natural selection, to our peculiar climatic conditions, and are better able to withstand them than many grasses brought from cooler climates, which, no matter how good they may be in their own habitat, are not fitted to districts liable to drought. There are many valuable kinds in our numerous and varied species, and among them will be found varieties suitable for almost every district. Many of the introduced grasses are, and will continue to be, the favourites for localities where the climatic conditions are similar to those to which they have become inured by long years of cultivation; but when they are removed to districts with absolutely different conditions, satisfactory results will not always follow.

Australian grasses have, through the wool and meat produced, obtained a world-wide reputation, and it is well worth attempting to still further increase their value, and that of the pastures, by carefully selecting and growing those varieties which have by actual results proved the best. We have many areas the stock-bearing capacity of which could be largely increased by a little judicious treatment; and with the increasing necessity of making the greatest profit from the land, attention might well be turned to our own varieties. In many cases in the western wheat country horses have been worked hard at ploughing for several months at a time, with no other feed than that which they have been able to obtain from the natural grass land. They have remained strong and healthy throughout, and have in some instances even put on flesh, and looked better at the end of the season than when they commenced work. This is an actual proof of the high nutritive qualities of our grasses, and if but a portion of the attention is given to them which other crops receive, highly satisfactory results must follow.

Mitchell Grass (*Astrebla triticoides*).—This grass, whilst giving fair results, has not thrived so well under our conditions as its power of resisting drought in the inland districts would lead us to expect. It does not appear to do well in poor sandy soil, and probably the different climatic conditions influence its growth. In its native habitat of the interior it has the reputation of being one of the most vigorous and fattening indigenous grasses. Even under extreme heat it produces abundant highly nutritive herbage, which stock eat greedily and do well on, even after it has become quite dry. This is a marked feature in many of our grasses, and is responsible for the heavy stocking which can be done throughout the year.

In our trials with Mitchell Grass it grew to a height of 18 inches and tillered largely, producing a large quantity of fine succulent stems and many leaves. It flowered in December, and remained fairly green throughout the summer. It has strong, wiry roots, and bears a fair amount of well-developed seed.

Tall Blue Grass (*Andropogon refractus*).—This variety remains green during most of the year. It grew to a height of 3 feet, and flowered in December. The stems are a little hard, and are scantily leafed; but a fair amount of succulent leaf is borne at the base of the stems. It is fairly prominent among the native grasses of the farm, and resists drought and heat well.

Brown-flowered Swamp Grass (*Diplachne fusca*).—This common name is somewhat a misnomer, as the grass thrives well on the driest soil. It is a rapid grower, and reaches a height of 3 feet. The forage produced is succulent during its young stages, and very useful for stock, but becomes slightly coarse after it flowers, at the end of November. The foliage remains green during the summer months, and dies down on the approach of frosts, and remains dormant until the following spring. It resists drought well, and grows on poor sandy soil.

Crab Grass (*Eleusine indica*).—A quick-growing annual grass, which resists drought well. It tillers largely, and a mass of herbage is formed about 12 inches in height; but it is rather coarse, and of little value. The seed is borne plentifully, and germinates freely.

Weeping Love Grass (*Eragrostis pilosa*).—This is one of the most vigorous varieties we have grown. It resists drought wonderfully well. and has always stood out from other grasses as a heavy yielder in even the driest years. The flowering stems attain a height of 6 feet, and bear leaves along almost their entire length. It is a rapid grower, and appears to be one of the best grasses for poor sandy soil. In its early growth, or

Tall Blue Grass (*Andropogon refractus*).

if kept closely grazed, it is succulent; but if allowed to make too strong a growth it becomes wiry. Its fibrous roots extend deep into the soil. The seed is produced in large quantities, and as they germinate well, the grass quickly spreads. This variety is perennial, and must not be confused with an annual Love Grass which slightly resembles it.

Rough Bearded Grass (*Echinopogon ovatus*).—Attains a height of about 18 inches, and gives a fair amount of foliage. It keeps green during the winter, and produces good feed when other grass is scarce. The flowering stems are produced in October; but it remains green up till Christmas, when it dies down until cool weather returns. It is very soft and tender in the leaf and stem until it flowers, when the stems become a little harsh. Seed is produced abundantly, and grows easily.

Eriochloa polystachya.—This variety grows to a height of 2 feet 6 inches, and flowers in November. Its strong roots penetrate deeply into the soil, and enable it to resist drought and thrive on poor soil. An abundance of fine, nutritious forage is produced, and is well liked by stock. It remains green until frosts occur, when it withers, and does not make a fresh growth until spring.

Australian Millet (*Panicum decompositum*).—This variety should be encouraged in all pastures. It resists drought well, and is a rapid, vigorous grower, attaining a height of 3 to 4 feet. It flowers in November, and the stems carry leaves along almost their entire length. Unlike a large number of our native grasses, it remains green well into winter.

Weeping Love Grass (*Eragrostis pilosa*).

A large amount of nutritious herbage is produced, which is greedily eaten by stock, and when cured makes good hay. It is one of the best of our native grasses for this purpose, and when cut it quickly sends up a fresh growth. The seeds are produced freely, and germinate well. Its deep, fibrous roots enable it to grow in almost any class of soil.

Vandyke or Yellow Grass (*Panicum flavidum*).—A quick-growing variety, which attains a height of 3 feet, and flowers in October. It is upright in habit, and does not spread rapidly. The herbage is scanty, and contains few leaves. It makes two or three growths during the season if cut.

Panicum leucophæum.—This is a valuable upright-growing variety. It produces a fair amount of herbage, which is fine and succulent, and

suitable for hay or pasturage. Its deep, fibrous roots render it capable of resisting drought and doing well in poor soil. The seed is produced freely, and grows well.

Forage Plants.

Sheep's Burnet (*Poterium sanguisorba*).—This excellent perennial fodder plant grows in tufts, and attains a height of 18 inches. Its strong roots penetrate deeply, and enable it to thrive in almost all classes of soil, from a heavy clay to almost pure sand. It resists drought and heat

...'s Burnet (*Poterium sanguisorba*).

wonderfully well, and when eaten down quickly throws up fresh shoots. Sheep eat it greedily, and rapidly put on flesh when fed on it. A heavy yield is produced, and it remains green throughout the year. The seeds are produced freely, and germinate easily. It is well worth extended cultivation to provide grazing for either pigs or sheep, particularly so as its permanent character makes it an inexpensive crop to grow.

Millefoil (*Achillea millefolium*).—A perennial forage plant, which produces a fair amount of fodder under favourable conditions. In dry seasons it gives a good growth in early spring, and dries off during the summer until the autumn, when it recovers, and gives a fair crop. It is a suitable crop for grazing to sheep, and does well on poor soil.

The House Sparrow in New South Wales.

[Continued from December, 1907, page 917.]

C. T. MUSSON.

As to sparrows destroyed through the agency of sparrow clubs and action of societies.

A considerable amount of good work has been done, but the efforts have been spasmodic and wanting in uniformity. Trapping is resorted to where there are sparrow clubs. A number of societies have for some years given prizes for eggs and heads with satisfactory results. One society (Hawkesbury district) last year held a sparrow crusade, poisoning a considerable number. Large numbers of birds have been destroyed, and the success attained points to a still greater success that would certainly attend an organised general crusade.

As to the prevailing sentiment with respect to the sparrow.

The bird is universally condemned.

As to suggestions received.

These probably cover the whole conceivable range of the subject, and can be roughly epitomised as follows:—

The authorities to take the matter in hand.

The societies to take the matter in hand.

Bonus to be given.

Regular crusade should be organised.

The authorities to advise best means; societies and individuals to carry out the details.

Killing the fledged young is the best method of taking advantage of the usefulness of the sparrow, and at the same time checking its ravages amongst grain.

Conclusions arrived at.

The sparrow is widely distributed; it is here to stay, and has to be reckoned with as a rapidly-increasing enemy to be combated before it becomes too oppressive in its detrimental action.

It certainly does good in destroying insects. A service which cannot be calculated and is frequently overlooked.

The damage done far outweighs the good, probably as 8 to 2.

Damage is greatest when the pest is present in numbers.

The sparrow was of no serious importance as a pest prior to 1890.

It is only within the last ten years it has spread widely and increased so much as to become a serious pest.

On large areas with sparse population we have difficulties in dealing with the bird not found where areas are smaller and population denser.

It has spread beyond the Darling, and is found in the dry western country as far as Milparinka.

It has become a menace to the agricultural industry and to fruit growers, and should be promptly checked.

It is a scavenger in towns, which form the centres from which the neighbouring country is invaded.

Round buildings it accumulates filth and is a means of contaminating the water supply.

In pastoral districts the bird gives little trouble.

It is in the farm the bird causes most loss.

It has spread mainly along the railways and roads.

There is no universal remedy which will get rid of the Sparrow.

Extermination is impossible.

Prevention of increase is possible, as also is reduction in numbers.

Bounty laws have not been a success elsewhere and are hardly likely to be so here.

The Sparrow always nests close to the habitations of man.

The Sparrow needs to be reduced in numbers and kept in check.

We must look to the individual to carry out the necessary work.

This can only be carried out by organised, united, and persistent effort renewed each year.

Every year this matter is left the birds will increase enormously, and probably the required labour and expense to be incurred in fighting them will be largely augmented.

There are signs that in the not very distant future a fresh "Balance of Nature" will be arrived at in this country in relation to the Sparrow and its present want of natural checks. This position has, according to a writer in the *Scientific American*, apparently arrived in the United States; largely brought about there by the native flesh-eating birds, the Hawks and Owls.

We should, however, do everything in our power to encourage the birds of prey likely to make use of the Sparrow as food. None of the small Hawks should be destroyed, nor should the Butcher Bird. They have only been destroyed in the past through a misunderstanding as to the nature of their food; they may do a little harm but they do a very large amount of good. We cannot afford to wait for this possible and probable course of events as the damage increases with the number of Sparrows.

With the expenditure of a little time and money, carried out on co-operative lines, the local agricultural and related societies supplying the machinery, it is quite possible to bring the pest within reasonable bounds during the next few years. The experience of our local society has shown that with one effort, carried out at a bad time of the year for the purpose, the numbers can be considerably reduced. Without doing anything else, prevention of breeding would alone answer the general purpose in view: the situations in which they breed admit of this being done.

Everything points to two lines of work as likely to give the best results if anything is to be done at all--

1. Prevent them breeding.
2. Reduce them in number by poisoning and shooting.

If the former is carried out, they will become reduced in number gradually through the operation of natural agencies.

If these two methods were carried out thoroughly for three or four seasons there would be no Sparrow pest worth mentioning; and a little timely work in looking after the breeding haunts would, in preventing the production of young, stop any great increase for the immediate future.

Introduction of Foreign Birds.

With regard to the indiscriminate introduction of birds to this country, a suggestion was once made to us (February, 1905) "that a little green bird (a nice whistler) from Hongkong, whose food is the moth (?), should be introduced here as likely to be of use in keeping down Codling Moth."

Without knowing something about the habits of any bird in its native home, it would be folly to introduce it into a new home; for it might prove to be of no real use and perhaps a positive pest.

In New South Wales, under the Stock Act, there is no restriction placed on the introduction of foreign birds. For regulations, &c., as to importation of other animals, see page 41, Stock Act. The Birds Protection Act gives no protection to Sparrows or Starlings. Originally Starlings were protected, but the protection was removed under *Gazette* notice 17th February, 1905.

Native Birds sufficient as Insect-checks.

We do not need the sparrow as an insect-destroyer. The native birds are numerous as to species and also as individuals, and are quite sufficient for our needs. The available feeding-grounds are admirably divided amongst the different groups: the ground providing food for many, others attending to the bark of trees; others, again, to the leaves and lesser twigs; whilst flying insects are mainly looked after by fly-catchers. Small plants, as vegetables, are attended to by certain of the ground-feeders, as the Chats, also some of the Tits (Yellow-tail) and the Silver Eye. The customary food habits are varied at times for change of food, much to our annoyance; for instance, in the case of the Silver Eye. The small birds should be encouraged and attracted under all circumstances, by not shooting or disturbing them, and by providing occasional food and a water supply. At the times when they are likely to be destructive we must watch them and drive them away.

General Suggestions with regard to the Sparrow.

Certain matters need to be strongly emphasized here if there is to be any effort made to reduce in numbers this increasing pest. Circumstances in this country are such as to allow it to increase to enormous proportions It has entered into a position here with tremendous possibilities before it in respect of space, food, sparse population, and absence of enemies for the present.

We cannot afford to wait until such time, if ever it arrives, when our native flesh-eating birds have come to the front and, as in other countries, act as a sufficient check; it takes time for them to become accustomed to a new article of food.

It is difficult to give any idea as to what the bird will breed up to if left alone for another five years. Let us assume that with us each breeding pair raises sixteen young in a year, and that these are half males and half females;

this is, perhaps, understating the case, but will sufficiently answer our purpose. There would be at the end of five years as the result of a single pair, if all the progeny lived, over 64,000 breeding pairs.

There are, however, losses from natural causes, which reduce the numbers very much, and which make any calculations purely speculative.

If left alone we can be sure there must be enormous increase, and it may be taken that they are now increasing four or fivefold each year. Under an annual crusade, at the end of two years the number of Sparrows in existence would probably be about the same as at present; if continued there would be a slight annual decrease.

The following general suggestions given merely in outline may be taken to be the outcome of this investigation as to the position of the Sparrow in relation to producers in New South Wales. They indicate just what would be likely to produce the desired result if persevered in, moreover they form an essential part of a general crusade against the Sparrow, which should culminate each year in a systematic winter campaign, as will be outlined below.

Recommendations as to what it is considered should be our policy with regard to the Sparrow.

1. It seems desirable that the importation of birds and other animals into New South Wales should be absolutely prohibited, except under strict supervision.

   Noxious birds or other animals should not be permitted to be moved from one part of the State to another.

   Power should be given to some authority (the Under Secretary for Agriculture?) to determine the advisability of admitting, or otherwise, any bird or other animal, their eggs, or young.
2. It should be a punishable offence to import into the State, or introduce to any new locality, any prohibited bird or other animal.
3. It should be a part of the duty of the Inspectors of Nuisances in towns, of the Police and any other officers appointed for the purpose to see that Sparrows are not allowed to breed about premises.

   Municipalities should have power to prosecute, and there should be a fine inflicted upon any person not complying with the regulations.

   The same plan should be adopted by the local authorities under any Local Government Act.
4. Householders should be compelled by the local authorities to carry out reasonable means for preventing sparrows nesting and rearing young.

   The same provision should be carried out by Station-masters and all persons in charge of buildings of all descriptions.
5. All Agricultural, Pastoral, and Horticultural Societies receiving a grant of money from Government should be compelled to spend not less than (?£10) per annum in fighting the pest, by offering prizes for eggs and heads, or in some other suitable way.

6. Such societies should make it a part of their regular yearly work—
    1. To offer prizes for eggs and heads.
    2. To organise the members into actively fighting the Sparrow in some recognised uniform manner, chiefly by means of a yearly winter crusade and by destruction of nests.
7. It should be a part of the curriculum in all schools, in connection with Nature study, to instruct scholars as to the life history, good and evil deeds of the common animals, especially instilling into young minds the necessity of following up this knowledge by "protecting the useful" and "destroying the noxious." Much can be done by encouraging "the boy" to a lifelong Sparrow war. This trouble is largely a matter of education. There should be a "Bird Day" in all schools, and special instruction, looking to the desired end.
8. Every effort should be made to prevent the Sparrow from making good a footing in any district at present unoccupied, or where a few are present. In the early days of its settlement it should be pursued relentlessly until exterminated, an end that can in such cases be attained.

Suggestions in detail, more particularly for the man interested.

The Sparrow is a cunning and wary bird, which learns to avoid poisoned food and traps after a few have tried them and succumbed. We must, therefore, meet cunning with cunning and endeavour to present things to him in such a way that they do not look like "preparation," but as natural as possible.

Every grower who is interested in the subject—and there can be but few who are not sufferers in one way or another—should help the matter on, by urging his local society to take the matter up and organise a systematic plan of operations for the district. When this is done, everyone should join in the matter heartily, carry out the instructions faithfully, and follow up the proceedings by undertaking such other suitable things on his own initiative as he is able to adopt, with the one end in view—destruction of the Sparrow. Most men only want to know what to do, and to see others do the same thing, when they will act likewise.

Destroy the nests and disturb the roosting-places.—Probably, the best result in any Sparrow crusade will be attained by regularly and systematically preventing the Sparrow from building; or, where nests are found, allowing the eggs to hatch and then destroying the young; the latter is the better plan.

It is believed that, in the fact that the Sparrow never nests far from buildings, lies the key to the whole question of preventing increase in this pest. The nests are always close at hand; the only requirement is never to let the young get away.

A hook of bent wire attached to a bamboo makes a useful instrument for destroying the nests.

The offering of prizes at local shows is a great inducement to this particular end.

To prevent sown seed from being taken, dip it, before planting, in tar water, afterwards drying it. One pound of tar steeped in boiling water overnight, and made up to 25 gallons, should be strong enough. Another plan is to moisten the seed with water and sprinkle on it powdered red lead, stirring it until well coated, drying it before use.

Still another plan is to sprinkle the seed with kerosene.

Seed-beds and small vegetable plots can be protected by wire-netting, but this is expensive as is also the netting of trees An old-fashioned but successful method for protecting seed-beds is to stretch fine white twine or cotton across them, tying bits of paper or feathers on them to make a scare.

The gun is a great help, as it frightens birds away. Naturally enough it is necessary to keep any "scare" going all day as long as the danger lasts. "Scare boys" are employed in England and elsewhere, always moving around the crop with loud-sounding wooden clappers.

Poisoning, when adopted, should be carefully planned, and everything done to prevent dead birds from contaminating water supply, to prevent poultry from taking the poison, and to protect farm animals. The native birds suffer also. This it is impossible to prevent where poison is spread in the paddocks; but it is a serious matter to kill off the native useful birds, such as magpies.

Encourage the natural enemies.—Hawks, butcher birds, and even owls will take sparrows. The domestic cat is also a great enemy.

Hedges should not be allowed to become dense, as if such be the case they make admirable harbours for the bird.

We should use the sparrow as food, and encourage trapping or shooting for the purpose.

Outline for an Organised Sparrow Crusade.

A general Sparrow crusade should be commenced at once. Success will entirely depend upon the hearty co-operation of every householder and every person suffering from the depredations of the Sparrow. This applies to town as well as country.

On the Victorian border the plan would not result in such permanent good as elsewhere, unless it were carried out in the southern State contemporaneously with us, for our side of the river would soon receive colonists again.

The two operations—(1) prevention of breeding, and (2) winter poisoning—must be carried out thoroughly and completely.

All newspapers should be requested to print this outline in full at earliest convenience, and again at beginning and end of July, in order to give reminders to all interested.

All Agricultural, Pastoral, and Horticultural societies are requested to take such steps as are necessary to secure the co-operation of their members in the general effort to check the bird.

Municipal authorities should at the same time prevent the Sparrow from rearing young in parks or public places.

If all join heartily in the crusade, success is assured, but action must be unanimous, and the work must be thoroughly done.

Summer Campaign.

To prevent increase in numbers.

All house holders in the State are requested, in the interests of the State, to prevent Sparrows from rearing their young upon or near their premises.

As the Sparrow never nests far from human habitations, this should not be a difficult matter to accomplish. The bird usually builds under house roofs, in spouting, in dense hedges and trees, in ivy, and other protected places. The nests are large and easily found.

The best plan is to let the parent birds hatch the eggs and feed the young for a week, then destroy the young before they can fly. The birds will rear other broods, often as many as four or five; these should be stopped in a similar way. Breeding is continuous from July to the end of summer.

If this were properly carried out, or even the nests destroyed before they could be made full use of, the bird would cease to increase in numbers

Boys might be encouraged to undertake much of the necessary work. Special inducements might be given by extending the system of giving prizes for "heads" at the local shows. Better prizes should be offered for heads than eggs.

This summer work should be followed up for two or even three years until the bird is completely under subjection, when the amount of work to prevent production of young would be reduced to a minimum.

Winter Campaign.

To reduce the number of those already in existence winter poisoning must be resorted to.

August is probably the best month, as there is less food about for them then.

The poison should be laid in such places as the Sparrows are likely to visit, where poultry are not likely to get at it, and far enough from any water supply to prevent dead birds from contaminating it.

The special method adopted should be suited to the locality.

If the area is baited with a little untreated grain for a few days before spreading the poisoned grain, the birds are likely to be less suspicious.

There should be three poisonings, each one to be carried out on three successive days at intervals of a fortnight. Convenient dates would be the last week in July, second and third weeks in August.

A bushel of grain for each poisoning should be enough; a third of it should be spread on the first three days of the week mentioned, in each case laying the grain in different places.

For the three poisonings it would, perhaps, conduce to success if the character of the food is varied. Cracked corn, millet, or sorghum might be tried, say, one of them for the second poisoning.

The most useful grain for the purpose is, undoubtedly, that which is mainly grown in the district where poison is laid.

Speaking generally, wheat is the most convenient to operate with, most easily obtainable, and most readily used.

Local circumstances may call for slight variations in the method. The important point is that all should poison at the same time.

How to Poison the Sparrow.

The various methods of preparing poison are given below. The societies interested might very well undertake the purchase of poison and grain where necessary, and its distribution to members. This would make it easier for the individual, who might find a difficulty in obtaining the poison; whilst the expense would not be so great on account of it being obtained in quantity.

Dry Method (advised as best).

Ten lb. of sound wheat is thoroughly damped with fresh milk, so that the grains are all wet, but not dripping with moisture. Five-sixths of an ounce of powdered strychnine, not too fine, is then shaken on to the grain, the whole being kept constantly stirred. When all the strychnine is mixed with the grain, it can be immediately laid.

Another Method.

Dissolve one-eighth of an ounce of powdered strychnine sulphate in half a pint of boiling water. Pour this while hot over 2 quarts of wheat (or cracked corn), stir well, and continue stirring until the liquid is absorbed. Dry thoroughly, without scorching.

Another very good Method.

Dissolve 1 ounce of Hulles' soluble strychnine in 4 pints of boiling rain-water, when cool add 15 fluid ounces of methylated spirit, then add enough rain-water to make 4 gallons strychnine solution. Take 1 bushel wheat, place it in a wooden keg or washtub; over this pour the 4 gallons of strychnine solution, and allow the grain to soak for forty-eight hours. Spread out and dry in the sun. It requires from 1 to 4 grains to kill a sparrow.

Phosphorised grain is sometimes used with effect, particularly when spread after sowing the crop.

Two Californian methods of poisoning.

1. Place shallow boxes on the end of a pole and put in 4 or 5 feet from the ground to keep the poison out of the way of poultry. In the boxes sprinkle maize meal and a very little strychnine, which mixture the birds eat. It will not hurt dogs or cats to eat the dead birds, as there is not enough poison absorbed by the bird.

2. Put the strychnine in pieces of apples and stick them on the ends of limbs of trees.

Method of spreading the Poison.

It is advisable to lay grain thinly in a number of places rather than thickly.

Take advantage of fresh warm horse-droppings to sprinkle a few grains of poisoned wheat over them.

After a crop has been sown, scatter a little poisoned grain over the surface of the ground.

Lay a train of chaff, and sprinkle a few grains along it.

A little chaff dropping out of the tail of a cart, with poisoned grain mixed, will give a very natural looking appearance.

Good results are obtained by laying bait on roadways near trees.

In cold districts, especially when snow is on the ground, and Sparrows are short of food, a train of chaff with grain may be laid within reach of some convenient place; when the birds are there in numbers a gun will kill off a considerable number if fired along the line.

Caution.

Persons using strychine for this purpose are earnestly cautioned to beware of its intensely poisonous nature. They should not allow anyone to assist except picked men. The greatest caution should be observed to prevent the possibility of an accident. When put away it should be securely packed and plainly labelled, and kept out of the reach of children and domestic animals. After each period of poisoning have the spouts and guttering on all buildings searched for dead bodies of sparrows.

Trapping

can only be satisfactorily resorted to when live birds are required.

Mechanical Scares.

A number have been devised; acting with more or less success. None of them, however, give completely satisfactory results.

Birdlime

is of little practical use in relation to Sparrows.

! ! ! !

With reference to the important work of exterminating the Sparrow, or reducing it in numbers, one correspondent replies as follows:—"I hit upon a plan that completely finished Mr. Sparrow; since then there has not been one about the place; this can be corroborated by my neighbours. I do not tell my method because it may be of value to me. It is effective and sure."

ACKNOWLEDGMENT.

Our Mr. G. Marks assisted in the preparation of the "Outline for a Sparrow Crusade." The literature of the subject, including the American Reports, has been freely used. Special thanks are due to the Principal (Mr. H. W. Potts) for permission and encouragement to carry on the investigation, and also for many facilities provided for its successful completion.

Correspondents who contributed matter for the purpose of our investigation are requested to accept this acknowledgment for their assistance, which alone enabled the writer to present a fair summary of the subject.

HAWKESBURY AGRICULTURAL COLLEGE.

MONTHLY WEATHER REPORT.

SUMMARY for December, 1907.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 9 years.	% of the year's Evaporation.
29·64 28.	30·30 31	29·95	45·3 6.	105·4 14.	73 29	72·15	36 4.	95 18.	59	·468 28.	8·259	6·636	17

Rainfall...											
Points ..	7	3	17	1½	21	45	4½	4	36	1	= 140 points.
Dates ..	2	7	9	15	17	18	19	29	28	31	

Mean rainfall for 15 years. 256 points.

Thunderstorms, 1st and 16th.

Wind ...	N	NE	E	SE	S	SW	W	NW
	6	18	4	5	6	5	6	5

Greatest daily range of temperature = 47·2°, on 14th.

Days on which shade temperature rose above 95° =	95·7	97·7	99·5	105·4	97·1	96·8
	1	12	13	14	26	27

SUMMARY FOR 1907.

	Rainfall.	Evaporation.	Mean Shade Temperature.
	inches.	inches.	
January	1·495	6·556	73·10
February	2·460	5·146	72 08
March	4·270	4·006	67·32
April ..	1·790	3·576	62·29
May ...	·595	2·113	55·84
June ...	3·000	1·636	51·94
July	·067	1·900	48·21
August	·285	2·769	52·24
September ...	·165	4 886	59·13
October	·635	6·877	66·03
November	1·605	8·174	67·90
December	1·400	8·259	73 29
	17·742	55·898	Mean, 62·44

Average annual rainfall for 27 years—30·357 inches.

Mean yearly rainfall :—Highest, 1892 ... . 50·24 inches.
Lowest, 1906 ... ... 17·16 ,,

Mean yearly temperature :—Highest, 1902 ... 63·12°
Lowest, 1893. . . 61·87°

Yearly evaporation :—Highest, 1907... .. .. 55·898 inches.
Lowest, 1900 ... . 43·343 ,,

The rainfall for July, 1907, is the lowest recorded for any month.

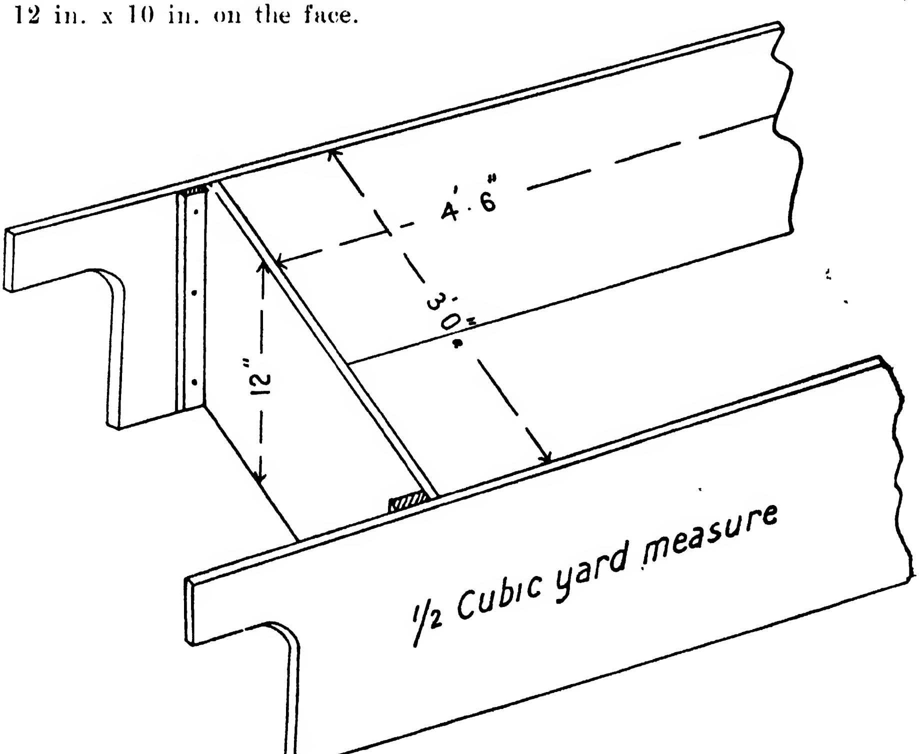
College records commenced January, 1893.

W. MERVYN CARNE,
Observer.

CONCRETE FLOORS.

A. BROOKS,
Foreman of Works, Hawkesbury Agricultural College.

OLD bricks, blue metal, or sandstone broken to 1½-inch or 2-inch gauge, clean sharp sand, Portland cement, and clean water are the necessary materials; a gauge-box, as shown in the illustration, made of boards, 12 inches deep, measuring 4 ft. 6 in. x 3 ft. inside, is also required. This is laid on a prepared platform of planks bedded flat and close together. Set the box on the platform, fill it with the stone, and again nearly half-full of sand; mix these together, then add one and a half bags or half a cask of cement, and mix all together dry, by turning over with shovels *twice;* then turn a third time, and while this is being done one man should sprinkle the water over from a watering-can; this heap should again be turned over, when any dry stuff should be wet as before. Care must be taken not to use too much water, as the concrete must not be sloppy; and after it is laid it should be lightly rammed with a flat rammer, say 12 in. x 10 in. on the face.



A Cheaper Concrete for such as Cow-bail or Pig-sty Floors.

Spread and ram down to the required levels the dry stone or other aggregate to be used, which need not in this case be broken to any

particular gauge. Mix a batch of stone lime mortar, using three parts sand to one of unslaked lime. This may be made up by opening out the centre of the heap of sand and placing the unslaked fresh lime in the centre; then sprinkle enough water on to reduce the lime to a powder, add enough water to make it like milk, and gradually mix in the sand; knock the lot into a heap, cover with a little dry sand, and leave it stand for a week. Mix up this into a grout or liquid mortar, and pour it over the dry stones until all the spaces are filled in, and next day render or plaster the top off with a coat of cement mortar ½ inch thick, ruled straight and trowelled hard.

Rendering.

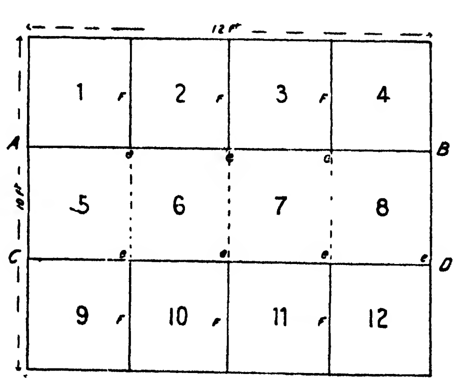
This is the term given to the finishing coat applied to walls or floors, and is usually done with cement mortar made of two parts clean sand to one part Portland cement, worked together through a fine sieve before being wetted for use. Care should be taken not to wet up any more than can be used within a half hour, as some cements set quickly (an indication they are not the best).

Mixing and Laying Concrete Floors.

A few hints as to how to mix and lay cement concrete, especially for such as pig-sty floors, may prove useful, and it is given here in the hope that it may be so.

Laying concrete floors requires two distinct operations—first, laying and ramming (lightly) the concrete in position, and then rendering or top-dressing with cement-mortar made of clean sand two parts to one part Portland cement, evenly laid and trowelled hard to a smooth finish. Concrete that is to be so top-dressed must never be allowed to dry before the rendering is put on, otherwise it will not adhere together, and no floor should be laid in large areas, but in small, easily worked slabs, otherwise the floor is sure to crack in various directions. This is more likely with floors of less than 6 inches thick.

To lay a concrete floor, say 12 ft. x 10 ft. and 4 inches thick, to be top-dressed (rendered) to a smooth finish, determine the height to the finished surface, and drive in pegs at the four corners; with a straight-edge or levelling rule, laid on the top of these pegs, measure down and cut out the soil to a hard, even surface, using the spade or square-mouthed shovel only, 4 inches below the straight-edge in every direction. This will make room for a slab of concrete 4 inches thick all over. Then divide the area, say, into twelve squares of 3 ft. 4 in. x 3 ft., thus—



From Nos. 1 to 12, and using boards 4 inches wide, with the upper edges straight, lay one from A to B and another from C to D, and drive pegs in the centre space behind them, as at *e*, *e*, *e*; then using short boards 3 ft. 4 in. long, place them three on each side, as at F, F, F, and fix them in position with pegs as before. Note that these pegs are not to be in the spaces to be filled with concrete; it is sometimes necessary to have them so, but they must be removed, and the holes filled in with cement mortar as soon as possible.

Having the concrete mixed, fill in slabs Nos. 1, 3, 9, and 11, keeping the surface lightly rammed down $\frac{1}{2}$ inch below the edges of the boards, to allow for the top-dressing. These should be allowed to set for, say, twenty-four hours, when the top may be finished off, trowelling hard with a steel trowel for a smooth face, or with a wood float or trowel if required for a rough face. Cut off the corners half V shape; then take up the short boards and place a strip of strong brown paper against the edges of the finished slabs; fill in Nos. 2, 4, 10, and 12, allow to set, and finish as before, then Nos. 5 and 7, then 6 and 8, and the floor is laid in twelve separate blocks that will, if the stuff has been properly mixed and a liberal amount of elbow-grease used, never crack or wear out. The quantities of material required for this floor would be—

$1\frac{1}{2}$ cubic yards stone, broken to $1\frac{1}{2}$-inch gauge;
$\frac{3}{4}$ cubic yards clean sand;
6 bags or two casks Portland cement.

On the Chemical Composition of some Australian Wines.

M. BLUNNO, Government Viticulturist, and L. A. MUSSO, Assistant to the Viticultural Branch.

THE tables below refer to the analytical data of some of the Australian wines analysed under the Wine Adulteration Act, 1902, with the view of ascertaining whether they had been submitted to any illicit treatment.

We are glad to say that the statement so often made of Australian wines, or of New South Wales wines at any rate, being adulterated, has little if any foundation at all, in so far in one case only we found one sample of sherry, one of port, and another of sweet red, all sold by the same South Australian firm, which contained an undue amount of sodium chloride, viz., common salt, for which offence the firm in question was fined.

Also in four samples of sweet wines recently analysed and not included in these tables we found an excess of alcohol, ranging from 1 to 5 per cent. of proof spirit above the limit of 35 per centum prescribed by the Act for sweet wines.

It was not thought opportune to lay any information against the merchants concerned as it was obvious that the slight over-fortification was due to a mistake of calculation on the part of the wine-grower or of the merchant, who generally do not possess the knowledge or the apparatus for an exact estimation of the alcoholic strength of their wines and of the wine-spirit used for fortifying. That there could be no malice in it is evident when considering that wine-spirit is not a cheap substance, and, therefore, no undue advantage would be gained by anyone to increase the alcoholic strength of wine, which would also raise the cost of production at a time when competition is rather keen.

It is generally said that Australian wines are too acid, and the expression is as colloquial as it is misleading. There are two kinds of acidity in wines, one which is called fixed acidity, and is that which is naturally found in grapes, consisting of malic acid (apple acid), tartaric acid, and potassium acid tartrate; the other acidity is volatile and forms during and after fermentation of the grape juice. This volatile acidity is higher in wines the fermentation of which has been neglected, or where the article is not kept with all the diligence and skill such as the keeping of wines in casks or in bottles require. Volatile acidity in wines is mainly due to acetic acid; with it smaller proportions are to be found of formic, propionic, butyric, valeric, caproic, and acids which are responsible for the nasty smell and taste of some wines. Volatile acids in wines are always the effect of secondary fermentations which take place while the alcoholic fermentation is in process or after, and naturally implies the presence and growth of bacterial life.

Not even the best of the world's wines are exempt from traces of volatile acidity; such traces are however so negligible that the trained palate, which is the finest analyser, fails to detect because the bouquet of said wines is so marked as to obliterate any contrasting organoleptic sensation. It is when

the volatile acidity from traces increases to appreciable proportions that the wine becomes more or less undrinkable.

Some Australian wines, like all wines produced in hot climates, show a marked deficiency in fixed acids on account of the grapes being overripe when taken to the crusher. This deficiency is mainly responsible for the development and growth of those micro-organisms responsible for the volatile acidity, as they thrive less in a medium with a higher degree of fixed acids. The hot weather prevailing at vintage and other factors referred to so often in the *Gazette*, enhance the activity of those germs, which by their multiplication encroach on the alcoholic yeast.

It is safe to say when tasting a bad Australian wine that its fixed acidity is relatively low and the volatile is high. Wines of this kind are then thought by people as having been adulterated, when really those wines are genuine and pure, only they have been badly made or badly looked after.

Those are the wines that, relatively few as they may be, discredit the New South Wales vintages, and as the mass of people in general is not apt to discriminate, a wholesale condemnation ensues.

In the wine-drinking countries of Europe a limit as to the amount of volatile acidity tolerated in wine is fixed by law, and the same should be done here by opportunely amending the Wine Adulteration Act, 1902. By doing this the sale of unsound wines, even if unadulterated, would be prohibited, and only a wholesome and palatable article would be found on the market. New South Wales wines have all the nourishing qualities of European wines. The proportion of ashes, viz., mineral matter, is from fair to good, and compares very favourably with any of the old-world vintage. The quantity of phosphoric acid is normal; the average quantity of sulphates is about ·6 per thousand cubic centimetres, therefore always far below the limit prescribed by the law; while Algerian, Spanish, and Portuguese wines often contain an undue amount of acid potassium sulphate on account of the old and unjustifiable practice of adding gypsum to the must during fermentation—still pursued by many growers in those countries. Boron is normal in Australian wines as in those of various other countries; but its proportion is so small that no person could make a point of it and elude the law if using boracic acid as a preservative. This State's wines contain also iron and manganese in proportion considered by the medical science sufficient to act beneficially. We have only made qualitative tests of the iron. Its presence in the New South Wales wines did not surprise us, as most wines contain it, but we were pleased to discover manganese as well, which we always found whenever looked for and determined quantitatively when in appreciable proportions.

We showed Dr. Th. Fiaschi the data relative to manganese found in the wines of New South Wales and that gentleman expressed the opinion that they represented the proportions administered for therapeutic purposes. For a long time it has been and it is still considered that iron and manganese are found in wine in a state of chemical combination that makes the two elements assimilable by the human system, and that state of combination, so it is believed by many medical authorities, has not yet been reproduced by any pharmaceutical preparation.

ANALYTICAL Data of some Australian Wines.

No.	Wine	State of origin.	Alcohol, absolute by volume.	Alcohol, proof spirit.	Fixed Acidity, calculated as Sulphuric Acid, in grammes.	Volatile Acidity, calculated as Acetic Acid, in grammes.	Extractive matters, in grammes.	Sugar, in grammes	Ashes, in grammes.	Sulphates.	Chlorides, calculated as Chloride of Sodium, in grammes	Preservatives and sweetening substances.	Sulphurous Anhydride, free, in grammes.	Sulphurous Anhydride, combined, in grammes.	Phosphorus, as P_2O_5, in grammes.	Tannin, in grammes.	Boron, as H_3BO_3 in milligrammes.	Manganese, as Mn in milligrammes.
			per 100 c.c.	per 100 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.		per 1,000 c.c.*		per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.
1	Claret ..	New South Wales	12·40	20·88	2·73	1·90	25·	.	..	Below 2 grammes per thousand.	below limit	Nil.	..	..	..	..	..	..
2	Hock ..	,,	12·80	21·4	2·83	1·5	21·25	.	..				..	..	..	..	..	..
3	Port ..	,,	15·60	26·30	2·3	2·	33·3	94·9	.				..	..	..	..	..	..
4	Madeira ..	,,	12·9	21·8	2·7	2·3	36·	126·6	..				..	..	..	..	..	..
5	Muscat ..	,,	12·1	20·4	3·5	1·8		106·	..				..	..	..	..	..	..
6	Red Wine	,,	14·05	23·8	2·13	1·4		36·			·09		..	..	..	..	..	..
7	White Wine	,,	15·07	25·3	3·0	2·1	.	.	.		·07		..	..	..	..	..	..
8	Sweet Red Wine	,,	16·10	27·3	1·9	1·4	.	42·5	..		·09		..	..	..	..	..	..
9	,, ,,	,,	17·92	30·4	2·7	·9	.	47·5	.		·23		..	..	..	..	..	..
10	Muscat ..	,,	16·33	27·7	3·1	1·1		115·			·12		..	..	..	..	..	..
11	Sweet White	,,	15·15	25·5	2·5	1·2		40·8	3·04		below limit.		..	..	·170	..	..	..
12	Sweet Red ..	,,	14·6	24·6	2·5	2		64·					..	..	..	..	..	..
13	Port ..	,,	14·9	25·1	2·8	2·		73·7	..				..	..	..	..	..	..
14	Sherry ..	,,	16·5	27·9	2·4	1·1		30·8					..	..	..	..	..	..
15	Muscat .	,,	16·5	27·9	2·8	·92	..	141·3					..	..	..	..	..	..
16	Sweet Red	,,	14·5	24·4	2·2	1·2		139·5					..	..	..	..	..	..
17	Sweet White	,,	16·5	27·9	2·2	·62		108·8	.				..	..	..	..	..	..
18	,,	,,	19·68	33·4	.	..	38·4	61·6			·07		..	..	..	..	..	..
19	Port ..	,,	19·96	34·	.		44	61·3	.		·27		..	..	..	..	..	..
20	Sweet Red	,,	18·25	30·9	.		54·7	82·8	.		·28		..	..	..	..	..	..
21	Sweet White	,,	15·12	25·5	..	..	.	39·4	.		·05		..	..	..	..	..	..
22	Sweet Red	,,	17·37	29·4	.		.	58·	.		·09		..	..	·195	..	..	..
23	Sweet White	,,	17·92	30·4	.	.		68·	.		·07		..	..	..	..	..	..
24	Sweet Red	,,	20·60	35·14	.	.	.	29·	.		·16		..	..	..	..	..	..
25	,,	,,	20·71	35·3	..			54·8			·16		..	..	..	..	..	..
26	Sweet White	,,	17·17	29·1	.	.		32·6	.		·05		..	..	..	..	..	..
27	Sweet Red	,,	16·36	27·7	.			40·1	.				..	..	..	..	..	..
28	,,	South Australia	18·78	31·4	2·1	·9	32·4	50·	..		..		..	..	·128	..	..	..
29	Hock	,,	13·81	23·2	2·1	1·2	17·25	..	2·25		·22		..	..	..	..	..	..
30	Chablis	,,	16·98	28·8	2·6	1·	24·9	.	2·00		·12		..	..	..	..	..	..
31	Claret ..	,,	14·10	23·8	2·8	1·2	24·9		2·7		·31		..	..	..	..	..	..
32	Port ..	,,	19·	32·2	2·8	1·3	37·4	48·4	..		1·17		..	..	..	..	..	..
33	Burgundy	,,	15·02	25·3	2·9	2·2	30·5	..	3·15		·29		..	..	..	..	..	..
34	Sweet Red	,,	19·	32·2	2·2	2·2	38·5	56·5	..		1·14		..	..	..	..	..	..
35	Sherry ..	,,	18·78	31·4	2·6	1·3	39·1	57·0	.		·73		..	..	..	..	..	..
36	Claret ..	,,	12·15	20·4	3·3	1·32	25·2	traces	2·45		·26		..	..	..	..	..	..
37	,, ..	,,	12·85	21·8	3·48	1·14	25·	,,	2·75		·27		..	..	..	..	..	..

* The limit is under this State's law ½ gramme per litre to 35 grains per gallon.—M.B.

ANALYTICAL Data of some Australian Wines—*continued.*

No.	Wine	State of origin.	Alcohol, absolute by volume.	Alcohol, proof spirit.	Fixed Acidity, calculated as Sulphuric Acid, in grammes	Volatile Acidity, calculated as Acetic Acid, in grammes.	Extractive matters, in grammes.	Sugar, in grammes.	Ashes, in grammes.	Sulphates.	Chlorides, calculated as Chloride of Sodium, in grammes	Preservatives and sweetening substances.	Sulphurous Anhydride, free, in grammes.	Sulphurous Anhydride, combined, in grammes.	Phosphorus, as P_2O_5, in grammes.	Tannin, in grammes.	Boron, as H_3BO_3 in milligrammes.	Manganese, as Mn in milligrammes.
			per 100 c.c.	per 100 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.		per 1,000 c.c		per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.
38	Hock ..	South Australia	11·80	19·8	3·4	1·2	20·7	nil	2·25	Below 2 grammes per thousand.	·22	Nil.	..	..	..	..	..	..
39	Chablis ..	,,	12·80	21·5	3·37	1·07	21·	,,	2 5		·60		..	..	..	..	..	..
40	Sherry ..	,,	17·15	29·	2 14	1·07	25·4	24 1			60		..	..	.	..	..	..
41	Port .	,,	16·7	28·4	2 03	1 35	45·3	49·3			·29		.	..	·210	..	.	..
42	Claret ..	,,	10 45	17 5	2·5	1·4	21·5	.	2·28		·20		·009	·036	.	..	..	..
43	Port ..	Victoria ..	17 50	29·6	2·35	1·5	38 97	59·4	2·45		·09		·001	038	.	..	..	..
44	Claret ..	,,	13·4	22·6	2·15	2 64	33 6		3·22		·23		·011	·022	.	..	..	..
45	Chablis .	,,	14 4	24·3	2·02	2·24	26 3		2·51		12		·005	046	.	.	..	..
46	Muscat .	,,	19·08	33·3	2·74	2 24	53·3	119·	3·82		·14		·016	·04	.	.	..	..
47	Hermitage	,,	14·10	23·8	2·55	1·52	38 6	.	3·24		·15		·007	·041	..	..	..	..
48	Red Frontignac	,,	18·08	30·7	2·61	1·2	50·3	59·1	3 24		·15		·005	·038	.	..	..	..
49	Constantia .	,,	18 08	30·7	2·7	1·2	48·8	60 0	3·25		·15		·005	·020	.	..	..	..
50	Sherry ..	,,	19·56	32·2	2 41	1·14	34·62		2 44		·14		·002	·008	..	.	..	..
51	Madeira ..	,,	20 06	34·	2·4	1 05	31 23	63·2	2·40		·12		·001	·040	·201	..	..	..
52	Port ..	,,	19·90	33·8	2·09	·7	46·4	76·1	2·80		·43		·006	·032	·106	..	..	..
53	,,	,,	20·24	34·4	1 96	1·14	38·3	72 7	3·13		·41		·016	·024	.	..	..	..
54	Constantia .	,,	19·20	32 5	2 22	1·15	46·52	74·4	3·2		39		·004	·016	..	..	..	..
55	Port ..	New South Wales	19 84	33·7	2·55	·59	32 3	54·3	2 50		·15		·006	·026	..	..	..	..
56	Burgundy	,,	15 30	25·8	2 47	1·47	24·38	4 4	2 58		·21		·006	·033	..	..	..	..
57	Claret .	,,	12·7	23·1	2·94	1·39	25·1	2·5	2 70		·20		·005	·028			..	..
58	Sherry .	,,	21·	35·9	2·3	1·3	27 4	14·3	2 46		·05		·012	·013	.	..	..	..
59	Sweet Red	,,	21·	35·9	2·15	·7	40·3	53·0	3 25		05		013	·036	..	..	..	..
60	Sweet White	,,	18·48	31·3	1·96	1·14	34·0	51·2	2·72		08		·004	·014	.		..	..
61	Riesling ..	,,	14 74	24·	3·20	·96	20 9	..	1·84		·07		·002	·007	..	..	..	..
62	Madeira	,,	14·84	24·4	3·20	1·05	21·47		1·88		·07		·002	·008	.	.	.	..
63	Sweet Red	,,	16·61	28	3 01	1·60	43·0	42 2	2·84		·18		·015	·009		..	.	..
64	Sweet White	,,	18·93	32 1	2·4	1·3	24·6	19·7	2·76		·11		·015	·084	..	.	..	..
65	Claret .	,,	13·71	23·1	2 94	1 63	25·5	traces	3 11		·18		·011	013	.	..	..	..
66	Burgundy	,,	15·77	26 7	2·61	2·16	24·	,,	3·08		·18		·012	·017	..	..	..	..
67	Muscat .	,,	18·58	31·4	2·3	·8	38 6	87·1	2·84		·10		·016	·075	..	..	..	..
68	Madeira ..	,,	18·78	31·8	2·02	1 7	27·1	18 5	2·16		·18		·004	·018	.	..	..	..
69	Port ..	,,	18·36	31·2	2·41	1 24	59·0	67·5	2·91		·13		·006	·013	·224	..	..	..
70	Sherry ..	,,	19·08	32·3	2·3	1·2	34·6	12·0	2·23		·17		·003	·007	.	..	..	..
71	Claret ..	,,	11 87	20·	3 3	1·6	23·8	traces	2·60		·19		·011	016	..	..	..	..
72	Port ..	,,	18·34	31·	2·28	·96	42·4	90·4	2·84		·25		·005	·018	·260	.	..	..
73	Muscat ..	,,	18·54	31·4	2·6	1·28	45 3	82 6	4·21		·23		·007	·013	·416	..	..	..
74	Sherry ..	,,	17·24	29·2	2·2	1·8	32·7	18·2	3·00		·22		·001	·006	·211	..	..	..

ANALYTICAL Data of some Australian Wines—*continued.*

No.	Wine	State of origin.	Alcohol, absolute by volume.	Alcohol, proof spirit.	Fixed Acidity, calculated as Sulphuric Acid, in grammes.	Volatile Acidity, calculated as Acetic Acid, in grammes.	Extractive matters, in grammes.	Sugar, in grammes.	Ashes, in grammes.	Sulphates	Chlorides, calculated as Chloride of Sodium, in grammes.	Preservatives and sweetening substances.	Sulphurous Anhydride, free, in grammes.	Sulphurous Anhydride, combined, in grammes.	Phosphorus, as P_2O_5, in grammes.	Tannin, in grammes.	Boron, as H_3BO_3 in milligrammes.	Manganese, as Mn in milligrammes.
			per 100 c.c.	per 100 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.		per 1,000 c.c.		per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.
75	Sweet White	New South Wales..	23·4	40·3	1·6	1·7	29·8	47·5	2·44	Below 2 grammes per thousand.	·12	Nil.	·004	·012	..	..	..	..
76	,,	,,	15·16	25·6	2·9	·56	39·8	79·7	1·41		·18		..	..	..	..	..	..
77	Port	,,	16·14	27·3	2·6	·88	31·2	59·5	2·30		·50			..	..	..	..	..
78	,,	,,	14·68	24·8	2·87	1·68	39·7	116·9	1·85		·05			..	..	..	..	..
79	Sherry	,,	14·39	24·3	3·3	1·3	36·0	110·2	1·51		·17			..	..		28	traces
80	,,	,,	15·85	26·8	3·5	1·84	37·7	79·3	1·70		·19			..	..	..	..	,,
81	,,	,,	17·14	29·0	2·4	1·3	24·5	59·5	1·70		·15		..	..	..	..	..	,,
82	Claret	,,	12·78	21·6	2·9	1·7	24·5	traces	2·32		·40		..	..	..	..	..	,,
83	Hock	,,	13·82	21·3	2·7	1·5	19·9	nil	1·80		·28		..	..	..	·121	..	,,
84	Port	,,	14·87	25·1	2·2	·6	32·5	traces	4·05		·48		..		..	·270	11	,,
85	,,	,,	16·64	28·3	3·	1·3	32·5	86·8	2·5		·18		..	..	..	·270	11	,,
86	,,	,,	17·64	30·00	2·6	2·1	33·6	75·3	2·75		·29		..	..	..	·576	6	1·5
87	,,	,,	14·63	24·8	2·9	1·2	28·5	114·0	1·91		·17			..	..	·256	6	1·2
88	Sherry	,,	14·29	24·1	3·1	1·4	29·6	119·	1·73		·15			..	..	·200	6	1·3
89	Claret	,,	15·07	25·4	2·3	1·1	28·5	2·2	2·46		·33		..	..	..	·410	16	·88
90	Hock	,,	11·86	19·9	2·5	1·3	21·	nil	1·88		·08		..	..	..	·019	..	1·4
91	Sherry	,,	16·64	28·2	2·5	1·34	30·0	85·9	2·05		·12		..		..	·064	..	1·
92	Claret	,,	12·5	21·	3·1	1·36	28·1	1·6	2·97		·16		..	..	..	·384	..	1·2
93	Port	,,	15·85	26·8	3·0	2·1	33·4	43·7	2·61		·20		..		..	·140	..	1·
94	,,	,,	18·36	31·1	2·8	0·56	25·	63·7	1·36		·13		..	..	..	..	..	traces
95	,,	,,	17·37	29·4	2·9	·7	28·5	72·1	1·66		·15		..	..	..	..	..	,,
96	,,	,,	18·25	31·	2·7	·5	33·1	59·9	1·76		·16			..	..	..	..	,,
97	,,	,,	18·34	31·1	2·0	·6	21·1	39·8	1·78		·05		..	..	..	·128	..	,,
98	Sherry	,,	15·75	26·6	2·2	·8	21·1	75	1·90		·36		..	..	..	·045	..	3·
99	Port	,,	16·64	28·2	2·5	·5	23·7	56·3	1·95		·20		..	..		·102	..	·8
100	,,	,,	14·2	24·2	2·7	2·3	29·	118·	..		below limit		..	..	·130	..	traces	traces
101	,,	,,	17·8	30·16	2·40	1·4		62·	..				..	..	..	..	,,	,,
102	Sherry	,,	20·25	34·47	2·0	·9	26·6	66·5	2·23		·08		..	..	..	·057	,,	·9
103	W. Shiraz	,,	16·64	28·2	2·35	·6	22·8	23·8	2·22		·16		..	..	..	·045	6	·7
104	Port	,,	17·94	30·5	2·15	1·6	34·9	51·6	2·95		·17		..		..	·268	28	·9
105	Hock	,,	14·77	24·8	1·44	1·2	18·7	nil	1·67		·10		..	..	..	·096	8	1·2
106	Sherry	,,	18·24	30·9	2·14	1·2	29·8	41·2	2·09		·09			..	..	·115	18	1·1
107	,,	Victoria	18·74	31·7	2·02	·7	26·9	53·7	2·33		·23		..	..	..	·121	14	1·4
108	,,	South Australia	16·94	28·7	2·4	1·68	43·6	59·4	3·32		·11				·313	·091	22	·5
109	Port	Victoria	17·44	29·5	2·25	1·44	42·2	57·3	3·94		·14			..	·217	·223	21	·7
110	,,	,,	17·94	30·5	1·52	1·9	56·4	71·6	2·99		·11		..	..	·195	·165	20	·9
111	Madeira	,,	18·44	31·3	2·02	1·6	41	64·	2·95		·22		..	..	·182	·083	28	·9

ANALYTICAL Data of some Australian Wines—*continued.*

		State of origin	Alcohol, absolute by volume.	Alcohol, proof spirit.	Fixed Acidity, calculated as Sulphuric Acid, in grammes	Volatile Acidity, calculated as Acetic Acid, in grammes	Extractive matters, in grammes.	Sugar, in grammes.	Ashes, in grammes.	Sulphates.	Chlorides, calculated as Chloride of Sodium, in grammes.	Preservatives and sweetening substances.	Sulphurous Anhydride, free, in grammes.	Sulphurous Anhydride, combined, in grammes.	Phosphorus, as P_2O_5, in grammes.	Tannin, in grammes.	Boron, as H_3BO_3 in milligrammes.	Manganese, as Mn in milligrammes.
			per 100 c.c.	per 100 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.		per 1,000 c.c.		per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.	per 1,000 c.c.
112	Port	New South Wales	18·64	31·4	2·41	1·2	32·5	55·5	2·79	Below 2 grammes per thousand.	·11	Nil.	..	..	·154	·190	14	1·7
113	Sherry	South Australia	19·55	33·2	2·15	1·04	20·3	4·6	2·36		·15		..	..	·147	·041	38	·9
114	Port	,,	18·44	31·2	2·14	1·2	35·4	77·2	2·74		·17		.	..	·172	·066	24	·9
115	Burgundy	,,	13·44	22·7	2·74	1·8	28·5	traces	3·21		36		..	..	·208	·256	..	1·7
116	Sherry	,,	18·94	32·2	2·22	1·1	28·1	22·8	2·60		33		..	..	·150	·083	12	1·7
117	Port	New South Wales	19·24	32·6	2·35	1·2	34·5	47·0	3·02		·14		..	.	·250	·165	18	2·8
118	,,	,,	18·54	31·4	2·10	·96	38·9	86·1	2·90		·11		..	..	·195	·141	28	3·
119	Sherry	,,	18·14	30·8	2·48	·96	29·0	16·1	1·89		·14		.	.	·236	·021	22	2·
120	Muscat	,,	17·74	30·0	2·3	·8	49·0	91·5	3·20		·11		..	..	·303	·302	36	2·
121	Hock	,,	11·86	19·9	2·8	1·2	20·8	nil	1·72		·13		..	.	·130	·033	4	3·
122	Sherry	Victoria	18·64	31·6	2·2	1·36	24·2	17·9	2·82		·14		..	.	·143	·054	36	1·2
123	Port	South Australia	18·84	31·8	2·2	·72	33·7	65·8	3·30		·14		..	..	·287	·385	22	1·5
124	Sweet Sherry	Victoria	18·24	31·0	1·6	1·3	25·	47·5	2·97		·28		..	.	·143	·083	40	3·
125	Muscat	,,	18·84	31·8	2·	1·4	39·	132·6	3·82		·11		..	..	·305	·242	40	2·8
126	Port	,,	18·74	31·7	2·3	1·1	32·3	76·	2·98		·27		..	.	·169	·099	28	·7
127	,,	,,	18·54	31·16	2·2	1·3	37·0	82·3	3·25		·11		..	..	·245	·157	32	2·
128	Hock	New South Wales	13·16	22·1	3·0	1·3	20·8	traces	1·80		·11		..	..	·162	·008	14	1·7
129	Port	,,	21·36	36·5	1·8	1·1	32·3	67·6	3·24		·11		..	.	·243	·049	32	2·
130	Sweet White	,,	20·45	34·6	1·8	1·2	20·14	36·0	1·80		·11		..	..	·037	·008	6	3·
131	Claret	,,	13·25	29·5	3·2	1·3	29·	traces	2·64		.		..	..	·183	.	20	2·4
132	Port	,,	20·05	34	2·0	1·2	50·2	83·0	3·48		·14		..	..	·260	..	28	3·
133	Muscat	,,	18·74	31·7	2·	·56	40·0	150·	2·94		·16		..	..	·239	..	28	2·8
134	Sherry	,,	20·05	34·	1·56	·96	24·3	21·2	2·06		·19		..	..	·155	..	14	1·4
135	Claret	,,	12·05	20·2	2·94	1·8	25·2	traces	3·22		·14		..	..	·460	·401	22	traces
136	Hock	,,	12·97	21·9	2·8	1·1	22·6	,,	2·32		·08		.	..	·340	·046	22	,,
137	Port	,,	19·08	32·2	2·	·6	40·5	120	2·43		·25		..	.	..	..	..	..
138	Sherry	,,	19·00	32·2	2·7	·8	33·1	96·20	1·79		·10		..	.	..	..	.	..
139	Port	,,	20·5	35	2·4	1·4	31·2	71·3	3·04				..	..	..	..	..	.
140	,,	,,	19·	32·2	2·4	·9	..	64·	..		below limit			..	.	..	..	..
141	,,	,,	17·55	29·70	2·5	1·3	..	63·6	..				..	..	.	..	.	..
142	Sherry	,,	19·9	33·62	2·5	1·4	..	2·4	..				..	..	..	.		..
143	,,	,,	19·3	32·7	3·5	·9	..	15·1	..				.	..	..	..	..	..
144	,,	Imported	19·72	33·5	..	.	24·2	traces	3·40		·17		·006	total (free and combined).	..	.	..	..
145	..	,,	18·74	31·75	..	..	41·8	,,	3·90		06		0·06		..	..	..	..
146	Swee [illegible]	,,	20·00	34·	..	..	47·	72·5	4·12		·16		·010		..	.	..	..
147	Madeira	,,	20·40	34·76	..	..	50·14	traces	2·63		·16		·013		..	.	..	..
148	Sherry	,,	18·80	31·86	..	..	46·35	,,	2·40		·18		·005		..	..	..	..
149	Port	,,	20·06	34·1	..		47·6	85·9	4·06		·21		·020		..	..	..	..

A Mammoth Poultry Farm

G. BRADSHAW.

INTRODUCTION.

THE following letter lately appeared in a weekly paper from one of its correspondents:—"The fruit-grower comes and stays and prospers, the small general farmer comes and stays, even if he does not always prosper, but the poultry-farmer comes and goes. His wire-netting is left to hang

Fig. 1.—A corner in the rearing ground.

useless from its supports, and his incubators go to swell the lumber of the auction room. It is doubtful if 10 per cent. of those who start poultry farming continue in the industry for more than one year, or perhaps two."

The above is not a lengthy communication, still it contains some truths, and a good deal apparently so, but all uncomplimentary to the poultry industry. However, without straining a point, every reflection is capable of explanation.

Concerning the fruit-grower coming, staying, and prospering, it is very well known that whether for the amount of cash and labour lost in the respective industries, or a putting of the abandoned orchards in county Cumberland against the poultry farms which once were, fruit-growing has suffered most. The proprietor of the poultry farm which forms the subject of this paper was a practical market-gardener and fruit-grower, with a few fowls as a side issue; the possibilities, however, for profit from the latter were such that there was a gradual evolution from cherries to chickens, onions to Orpingtons, lettuce to Leghorns, and mandarins to Muscovies, the mixed farm ultimately disappearing in favour of a farm of fowls, a permanent one, the largest, and from every point of view one of the most successful in the Commonwealth. A further testimony, too, in relation to the profitableness of the poultry industry in comparison with the one to which the correspondent attaches prosperity, is the fact that independent of our very large consumption of poultry and eggs, the small farms and other holdings in the Commonwealth are able to produce enough for all our demands, there being but a couple of hundred pounds of difference between the imports to Australia and the exports to other countries, while coming to the fruit, the imports of fresh, dried, canned, and otherwise preserved exceed our exports by hundreds of thousands of pounds annually.

Fig. 2.—Big responsibilities.

Fig. 3.—Just out.

From these facts it must not be supposed I am desirous of placing one industry against the other, but rather to give facts and figures to discount the condemnatory terms in which poultry breeding is frequently referred to. I should here say that the subject of this paper is a poultry farm pure and simple—that is, there is no other stock or article produced on the place for profit beyond eggs and meat—yet, despite what I know of the profitableness of the place, that is no reason for those lacking experience

to believe they can go and do likewise. Any attempt at poultry breeding for profit should be commenced in a small way in conjunction with some other issue of the farm. It is this specialist poultry farming which has given the industry a bad name; and the man who wishes to make a living from his fowls must have, as the owner of this farm had, other strings to his bow, a few years experience soon showing whether any of them can be dispensed with, and if so the determination will likely be that the labour and care which hitherto had been divided amongst the peaches, potatoes, and pigs will show a better return by a transference to poultry.

Fig. 4.—Six hundred ducklings! three to six weeks old.

CHAPTER I.

The Locality.

Every Sydney or suburban resident has heard of The Spit, while thousands of them—cyclists, picnickers, and others—annually visit the place, but possibly not 1 per cent. of those who cross on the punt are aware that the largest poultry farm in the Commonwealth is situated within the proverbial stone's throw of the landing-place on the Manly side, and just beyond and to the right of Seaforth. The slow walker can do the journey in fifteen minutes, while residents who know the short cuts calculate as ten minutes from wharf to farm, which is a corner block bounded by The Spit, Manly, and French's Forest Roads. Cyclists, motorists, and other tourists who from North Shore-wards to the village ascend the heights by the zig-zag Government road, but to reach the farm on foot one goes a few perches to the right and is brought to a well-made track through the bush, which brings him right to the public school, it and the 2 acres of ground being originally a portion of the farm; proceeding down the French's Forest Road past the school, one comes to a large gate, which tells visitors they are at "Glenbrook." This opens into a wide avenue, and leads to the stone homestead, one of the bungalow type, substantial in the extreme, and has been the home of perhaps scores of owners, from a Government architect to a Chinese gardener. To some the place was a retreat after the city toil; the remaining massive, but now neglected fruit-trees tells the place was at least a one-time prosperous-looking orchard. In more recent times, however, it failed to afford a living to several

tenants, until some half-dozen years ago, when the present owner, Mr. J. McComb, purchased it, and transferred his not too numerous stock from his neighbouring farm to this one, since when it has developed into what the numerous illustrations depict—a poultry farm of mammoth dimensions, and of unquestioned prosperity.

CHAPTER II.

The Farm.

The proprietor is a North of Ireland Scotchman, arrived in New South Wales with some relatives when about 15 years of age, and settled down with them on a farm named Mount Pleasant, in the Manly district, about a mile from "Glenbrook." Mount Pleasant was the country residence of an uncle of Mr. McComb, and a well-known city man. Market gardening, fruit-growing, and pig breeding were conducted at the place. In course

Fig. 5.—Almost ready for market.

of time the uncle died, and left the nephew an inheritance which, under other circumstances, would have placed him beyond the tending of cabbages or the dread of swine disease. The inheritance was in the form of bank and building society shares, but many being unnegotiable, rather than a rich man his position when thoroughly realised was that, although not penniless, he was obliged to take a serious view of things, and what was a perfunctory sort of management of the farm for a relative, who perhaps did not expect much profit, now became a reality when a living had to be made. A number of profitable years attended the operations, then the inevitable drought came, the one or two lean years eating up all that was stored in the fat ones, convincing Mr. McComb that to battle with the elements in the interests of market gardening for profit on such

an elevated position could never be a financial success, and from this on less attention was given to industries which depended so much on climatic conditions, gradually increased his stock of fowls, ultimately doing so well with them that six years ago he purchased the present farm "Glenbrook." Each year since the date of purchase he has increased his stock, until at time of writing there are located on the 18 acres about 1,800 ducklings up to 1 week old, 3,000 from 1 to 4 weeks, 3,000 from 4 to 8 or 9 weeks, 1,200 Muscovy stock ducks with a proportion of drakes, 500 English ducks, and about 3,000 hens, or well nigh 13,000 all told.

The farm is 18 acres in extent, about 14 acres of it is occupied by the poultry, the school end being largely in its primeval state, Christmas bush

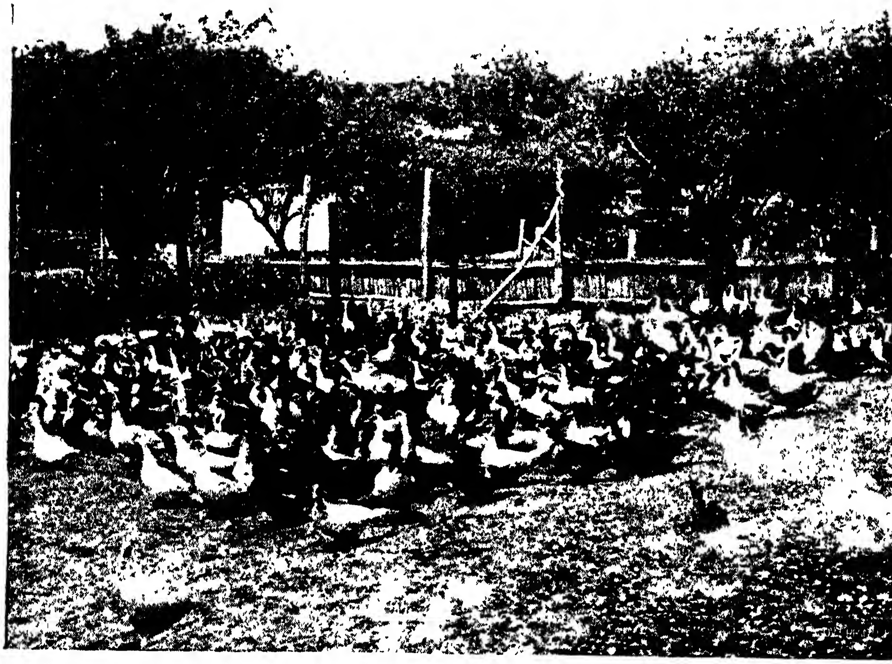


Fig. 6.—Portion of a flock of 1,000 laying ducks.

abounding. The soil is of a sandy nature, and although there is an ever-running creek along one boundary of the farm and ponds on the place, city water is largely used.

One half or more of the farm was originally an orchard, many giant pear, peach, mulberry, and other trees still bearing, the proprietor's value of this product being that, while every egg is carefully gathered, the fruit is allowed to lie where it falls, until eaten by the fowls or ducks located underneath. The soil, the shade, the situation, and its proximity of 6½ miles to Sydney, all combine to make the place what it is—an ideal one for profitable poultry farming.

Chapter III.

The Houses and Runs.

It is quite simple to hear, read, and talk about thousands of ducks and fowls, but seeing them is a different matter, and when nearly two thousand tiny things of under 1 week old are brought under notice, one wonders how they are all accommodated. Although there are foster-mothers, they are not of the wooden sort, but Muscovy ducks, which are usually given from eighteen to twenty-five to brood. Figure 2 illustrates this system of rearing.

Fig. 7.—Two rows of hatching boxes, with 500 in the distance.

To accommodate the thousands mentioned, there is an extensive nursery ground (Fig. 1), located under an avenue of trees, with moderate-sized houses, open fronts, and grass runs. The houses are not large, there being no necessity for this, as the baby ducklings live the greater portion of their time in the open air on the grassed shady runs, only visiting the straw-bedded houses at night, when they are shut up with a wire-fronted door, to prevent them in case of rain or storm running out in the wet, which is most devastating to ducklings of tender age.

Three or four mother ducks occupy each of these houses and runs, for, unlike hens, they live most agreeably, not knowing or caring whether a duckling is one of their own brood or not, and bestowing the same motherly care to a hundred as readily as to a single protégé.

Fresh city water is always kept before the ducklings; the vessel resembles a galvanised handless dipper, upturned in a saucer of the same material, a small hole near the rim of the upturned vessel keeps a supply in the saucer.

CHAPTER IV.

The Hatching.

To have seven or eight thousand ducklings of various ages on a farm must involve very extensive hatching operations, and in places where the stock is considerably less than at Glenbrook, I have seen sixteen or eighteen incubators of various sizes in use, this being quite a department of the farm. Not so at The Spit farm. There certainly is an incubator-room, and not too large for the four machines it contains; but if each one turned out the ducklings as two of them did on the morning of the photographers visit, then both fertility and hatching must be of the best. The

Fig. 8.—A yard of Leghorn and Orpington layers.

incubators are home-made, and do good work; but the principal hatching is done by the system shown in Fig. 7, where two rows of hatching boxes, numbering from forty to fifty in each row, are seen, and over 500 boxes in the distance. These are principally butter-boxes, placed in rows close to one another, in the middle of a large paddock, and each tenanted by a Muscovy duck, under which are from fifteen to twenty eggs in various stages of incubation.

It might appear a sort of cruelty keeping these hundreds of ducks in a five weeks' imprisonment, without even a leaf of shade. The photograph, however, shows that the sitting-boxes are all covered, the material being thick oilcloth or tarpaulin, some tons weight of which were purchased at an auction sale cheaply. Each row is covered with this material, which hangs over the front of the nest, with a split in centre, which allows the duck to come off her eggs for food and water, and return when satisfied. About 600 of these boxes were occupied on the day of the writer's visit. Fig. 12 shows a due hatch, ducklings having chipped the shell, some hatched being plainly visible.

Concerning success in hatching, Mr. McComb says he places all the eggs possible under hens or Muscovy ducks for the first week, and then removes them to the incubators, when almost every fertile one hatches. Several experiments made at the American Agricultural Stations have demonstrated the same thing, while the manufacturer of one of the most popular incubators in the United States lately told a large audience that incubator manufacturers had not yet mastered the subtilities of the first seven days of artificial incubation, that the hen and duck were for that period still easily best.

Throughout the present season there have been many complaints about the infertility of both duck and hen eggs. Mr. McComb, when asked his

Fig. 9 "Train up a child, &c."

experience of the matter, replied that the fertility of the English duck eggs in the early part of the season was bad, later fair, while the Muscovies were fertile right through the season.

Chapter V.

The Rearing and Feeding.

Although most poultry people are anxious for big hatches, these same people when they do get them occasionally have ill success in the rearing. The proprietor of "Glenbrook" has no trouble, while the feeding is of the simplest. The Muscovy duck when her hatch comes off, if not a large one is made up, twenty-five or thirty being the number given—they may be made up from the incubator or two broods given to one. The first and

succeeding food for the newly-hatched ducklings being simply bran and pollard mixed crumbly with milk, soup, or, in the absence of these, water; when a little older, chaffed green maize or barley is added to the above, and from five weeks and over boiled kitchen waste, mill-dust, &c., forms a portion of the rations.

For the laying and stock ducks pollard, bran, bakehouse refuse, cooked meat, and other household waste is all fed. To get eggs in abundance meat or its soup must be supplied; and there is nothing better than hotel, restaurant, and other kitchen waste for this purpose. A large waggon visits North Sydney each day, calling at the butchers, the bakers, and other places for the materials mentioned; a second horse is sent to meet the first on each day on the return journey at The Spit to assist in the hauling.

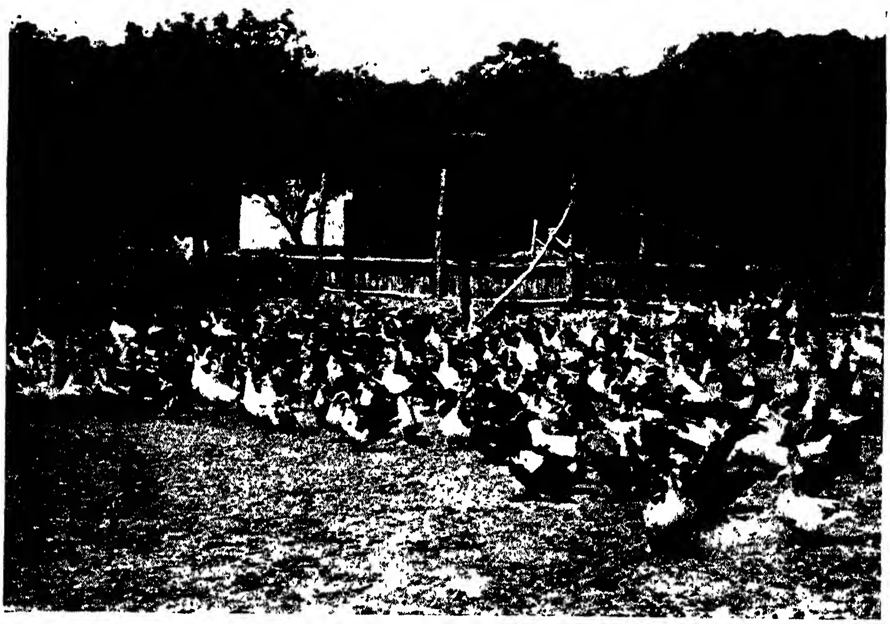


Fig. 10.- A yard of Stock Muscovies.

Fig. 4 shows about 600 ducklings from four to six weeks old, and Fig. 5 a large number getting ready for market, while Fig. 10 shows a yard containing over 1,000 stock Muscovies.

Chapter VI.

The Fowls.

Some poultry farms specialise in ducks only, others in fowls; that at Manly carries large numbers of both. Figs. 8 and 9 show one yard of these, perhaps numbering 300, which is about the tenth of the fowls on the farm. They are kept in large yards with much bush, in flocks of from 100 to 400

each, and, as the photograph shows, are mostly Leghorns or Orpingtons. There are large roosting-houses, but many of them perch on trees. The laying houses are commodious, divided into hundreds of nest boxes, but neither nesting material or nest-eggs. Whitewash as a vermin killer has been found useless; an occasional painting of the roosts with wood-preserving oil or kerosene keeps them clear of all vermin.

The feed for the hens consist of pollard and bran mixed with chaffed green stuff, scalded with meat-soup from the sheeps' heads; wheat for the evening feed in summer, and corn in winter. Meat is also regularly supplied as a means to good egg results.

In connection with the fowls, a remarkable thing was witnessed. There was not a male bird visible on the place, and more remarkable still, there was not a chicken to be seen. Questioned on the matter, the proprietor replied: "Roosters are no good to me; they would only eat food. I keep my fowls for laying only." When told that whatever the fowl's age was

Fig. 11.—A flock of Blue Orpington ducks.

now, in a year or two they would be too old—and where are your chickens to take the place of the old ones: "Oh!" said he, "I do not rear any chickens. Taking into consideration infertile eggs, losses in rearing, and time incurred, when I count everything I cannot bring chickens to the age of laying for less than 2s. 9d. or 3s. each. The Manly district is a wonderful place for people starting poultry farming. Many of these beginners are unsuccessful, in a year or two giving the business best, and I generally purchase their stock at much less than I could rear it. Frequently I have bought people's stock right out at 2s. to 2s. 6d. a couple, young and old. I handle every one I buy, and put a mark on the young ones by which I always know their age. I place these in a pen by themselves, and in a few days if any of them appear not to be doing well I send them and the old ones to the saleyards, where perhaps on the same day I may purchase young stuff for less than the old ones fetched. I do not know," said he, "how people can rear fowls at the price. I could not; or, rather, when I can purchase ready made, why go to all the worry of rearing?"

It was remarked that he could not expect a good laying strain by procuring the fowls in such a manner. "Cannot I?" said he. "I am prepared to place 100 out of any yard in the place against 100 of some of your much advertised laying strains, and have no fear of the results." Did not this system of purchasing layers leave oneself open to the insinuation that the practice was poultry dealing. "Call it what you like," said Mr. McComb. "Certain big city firms both make and purchase furniture. When they can purchase cheaper than they can make, they purchase; still they would object to be termed dealers."

Fig. 12.—Patience rewarded.

Concerning the remark about so many people commencing poultry farming in Manly and failing to make a success of it, the "Glenbrook" proprietor, in reply to the query, said there were several reasons for the non-success. "Some poultry-men when they commence keeping a few fowls and having done well with them are not satisfied, but run off to the newspapers to tell their achievements, and even forward the balance-sheet, which has been frequently published. Perhaps the man is never heard of again in the poultry world, or if so, it is in a year or two hence, when all his fowls and incubators are advertised for sale. However, before this trouble came about the harm was done. Some poor fellow with one or two hundred pounds read about the money that was to be made by poultry-keeping, and invested all he had in the undertaking. He had no

experience, and would have had an equal chance of success had he started a jeweller's shop. Some find the work too hard and the hours too long; others expect too much, and fail to realise that even when a poultry farm is doing well it requires a pretty extensive one to keep a house and family after paying the feed bill, cartages, commission, &c. Then disease gets into some of the farms early in their existence, and good-bye to profits. Laying competitions also have done harm, in that they did not show the actual net profit. The surplus over the food bill was called profit, but it was not; there was all the labour, cartages, wages, commission, &c. Neither did the sixty or 100 hens lay all the eggs credited to them. There were many deaths, as in every poultry flock; for everyone that died another was supplied from the owner's yard; so that in place of 100 hens laying so many eggs, often it took 120 hens to lay the number. The poultry farmer does not get his laying fowls supplied to him free, and when deaths occur there is no one to replace them as at the competition. I must remark that all the people who start poultry farming about Manly do not go wrong. There are several doing nicely, and although not in a big way are perhaps making more actual cash than those who advertise themselves so much. The successful ones I refer to are not in a big way, but that time will come. Poultry farming is a business that cannot be rushed, and those who do not expect too much, manage intelligently, have patience, and can afford to wait, will have their reward."

Chapter VII.

The Eggs and Meat.

As has been seen, the large majority of the ducks kept are Muscovies. This is due to the fact that the market demands them. There is always a sale for English ducks at a price, but young Muscovy drakes are a standard article for which there is a demand every market day in the year. Those marketed from "Glenbrook" fetched throughout the year from as low as 5s. 3d. per pair; the highest price received was 10s. 9d. Muscovy ducks do not attain the size of the drakes, 6s. per pair being the highest price received during the year, and as low as 3s. 3d. per pair. English ducks are kept on account of being considered better layers than the Muscovies and do not go broody. At one time there was a bit of a boom on a cross between the Muscovy and English duck, but it did not last long. The poulterers did not like these mules; and it is not a matter of what one cares to breed, it is what the market demands. There are between fifty and 100 Indian runners crossed with English ducks on the farm. They are good layers, and the eggs larger than the pure runners, but the ducks are inferior for market purposes.

Fig. 11 illustrates a flock of Blue Orpington ducks. This breed was first imported to the State in 1895, and has formed portion of the Glenbrook stock for several years, and are kept principally on account of being excellent layers, and large-framed ducks as well. The drakes show a

broad white ring on neck, sometimes extending down the breast, the remainder of the plumage being an even blue colour.

Buff Orpington ducks are also kept. Questioned about the quantity of eggs sold weekly, and when and how disposed of, Mr. McComb said: "I supply several shops in North Sydney with from 100 to 200 dozen weekly, the balance Mr. T. Clarke, of Sussex-street, sells. One of my best weeks was 800 dozen all told, but 700 dozen is quite common." When saying this, Mr. McComb handed over the Sussex-street account sales, which verified his statement.

"For the last six years," said Mr. McComb, "I have stored eggs largely in the Government Cold Stores, sometimes for myself, at other times for the grocers, to whom I hand over the store warrants. I handed the warrants to Mr. Clarke to take delivery of my last sixteen cases. He went carefully through the lot, and out of the 576 dozen only got two and a half dozen of faulty ones. The lowest price I received for cold-store eggs during the year 1907 was 1s. 1½d., and the highest 1s. 9d. I have 118 cases of thirty-six dozen each stored at present. For ordinary eggs the lowest price obtained throughout 1907 was 8½d., the highest 2s."

Chapter VIII.

General.

Glenbrook Farm is a square block, barring the public school corner. For the rearing, housing, and general purpose of the farm there are erected eighty-six houses, with yards or runs. The houses are from 6 ft. x 3 ft. 6 in. to several very large ones ranging up to 120 ft. x 12 ft. Right through the yards, except where the newly-hatched ducklings are, there is a system of continuous open troughs, through which a constant stream of city water flows, the stock taking their supply as it passes along. The supply is from a stand-pipe on the highest portion of the farm, the tap being turned on to a grade sufficient to allow enough for the wants of ducks and fowls. This system has the advantage of supplying fresh cool water in the warmest days, and saves a large amount of manual and horse labour. At the lower end of the farm and furthest from the dwelling-house, is the boiler and other appliances for cooking and manipulating the food, which for such a stock is so considerable that a horse is employed a moderate portion of the day hauling a slide loaded with food to the various yards. The proprietor could not exactly tell what weight of food was consumed daily, but assuming that young and old averaged 4 oz. each, that would come to over a ton carted daily to the stock, irrespective of the large quantities of bran, pollard, wheat, and maize used.

Although the yards for the growing ducklings and stock ducks are very large, still with the excrement they soon become foul. At this stage they are ploughed up and sown with barley or maize, which in a short time not only sweetens the ground, but affords a continuous suply of most succulent green food, which is chaffed and mixed with the other materials.

A large yard of maize will be seen in Fig. 6, where it affords a background for the breeding ducks. In the lower portion of the ground, and adjacent to where the food is cooked, is a large iron feed-house 36 feet long by a great width, built on rock, and capable of holding 50 tons of foods. When the late rise to 1s. 6d. per bushel for bran and pollard took place, there was in store 10 tons of pollard, about the same of bran, and about 100 sacks of wheat and maize. The lowest price paid for pollard and bran during the year was 8½d. per bushel, and the highest 10d., thus showing that the big man in any business, if he cannot sell better than the small can sell more profitably through being able to buy more cheaply. The bulk of the maize bought throughout the year was from 2s. 4d. to 3s. 6d., the late price being 4s. 9d.

To keep a place like this going from one year's end to another naturally involves a great deal of both manual and horse labour. Four men are employed all the year round, and one casual; four horses are also required to keep the place going, one as has already been shown in daily carting food to the place, and a second one to assist him in the haulage. Then there is the food to be conveyed to the different runs by horse-power, while another one spends the half of its time in making several journeys in the week to Sydney with eggs, ducklings, and fowls.

The farm throughout is clean and free from smells, and although cooking is done on the place, in the absence of offal it does not come within the region of a boiling-down establishment.

CHAPTER IX.

Financial.

In the earlier portion of this paper, Mr. McComb speaks lightly of some poultry-men foolishly making public the financial part of their operations. With him the writer thoroughly agrees. If a man opens a butcher's or grocer's shop, he does not run off to the Press telling all and sundry how much profit he made. Indeed, if his venture was a profitable one, that is the better commercial reason why such should be known only to himself. Frequently when balance-sheets are published the place has not had more than one or two years' existence, and it often happens that it takes the third or fourth year to find the stability of a poultry farm. Holding this view in common with the owner of the Glenbrook establishment, I was a bit chary in making advances with the purport of drawing him on the financial results. I however, ventured, "Would you care to tell the readers of the *Gazette* anything about the profits of the concern?" "I thought it would come," he replied; "you poultry writers are all alike. Why don't you ask me straight out does it pay? when I would tell you 'No; I only keep the men for the sake of paying them wages, and work myself twelve hours a day for amusement.' But, seriously, had anyone the cheek to go into one of the large drapers or grocers in Sydney and ask them if their business paid, and what profits they made, he would

be ordered off the place, and deserve it, too. What socialistic feature is there about poultry farming that everyone who comes along is expected to be told whether the business pays or not, and, if in the affirmative, expects to see one's balance-sheet? My experience," says Mr. McComb, "is that the man who is making money in any business discreetly keeps quiet on the subject, the hard-up ones being frequently the most voluble as to how well they are doing." Mr. McComb does not make any claims as to the success of his farm, and says if people believe he is doing well, there are other poultry breeders doing better, and who prefer hiding their light, marketing their fowls, and pocketing their cheques without any ostentation, as is done in any other business.

Reverting to the remarks throughout this paper about many people going into the poultry business, and with unfortunate results, like disappointments occur in every known business throughout the world, even in America, of which we read so much of the success of the poultry business. The following article from a recent issue of a leading American poultry journal gives the other side of the picture, the failures in that country, as here, being largely due to inexperience:—

An epidemic present in all seasons of the year, "The Poultry Fever," contagious to a marked degree, its victims men and women in all stages and walks of life.

One can safely say without fear of contradiction, that there are more failures, year in and year out, in the poultry industry than any other industry one might name. Most of these failures are entirely uncalled for, and are generally, if not always, made by those individuals who lack the push and energy which goes to spell success in any industry or vocation they might choose to follow. The man or woman who lacks in the sense of detail—a sense which must be most highly cultivated in the "chicken crank"—better let poultry in any of its branches alone, for success along that line will never be their reward.

The poultry industry is the most fascinating and luring of industries, hence its many victims. Its profits look so large on paper that the idle dreamer and get-rich-quick individual often dream of fabulous wealth in a short time. They count their chickens before they are hatched, as it were.

Nevertheless there is no industry which shows better returns for the amount of capital invested as that selfsame "chicken business." Start at the bottom of the ladder, and steadily but surely work upwards, that's the only safe and sane start for the average individual, and learn from your own experiences, which will be varied and abundant; watch your flock closely, study their daily habits and needs, and above all do not neglect the minute details, therein you will find your success hidden, so "seek and you shall find." When you start your venture, start right. A poor mechanic requires good tools to work with, so procure good birds for your foundation stock. A few good birds of exceptional quality and worth are better than a larger flock of inferior quality. Many large and successful poultry plants were started with a pen or two of really good birds, and that same opportunity is still open to you.

No matter what your intentions are, fancy or commercial poultry, they go hand in hand. The day of "scrub" poultry farms is near its end.

The following was contributed to another American poultry journal, all showing that, as here, there are successes and disappointments in the poultry business:—

We see or hear of some cases in which poultry is condemned on account of one or more individuals having made an attempt at rearing or keeping poultry and having been unsuccesful in it, and out they go, saying that

poultry-keeping is no profitable pursuit. They have failed. Why do they fail? Why are they not successful? Let me ask a broader question: Why are some people successful with poultry and others a dismal failure? One question gives rise to several others. Are all failures due to the same reasons? Is it the breeder himself or his method of management that brings on his bad luck? I dislike that expression "bad luck." There is no such thing as bad luck in the poultry business, except in rare instances. Things don't happen. They are just as one makes them. If you want to use that expression "luck," here is a good definition of it: "Bad luck" is simply a man standing around with his hands folded and idly letting his work go on as easily as possible and waiting for success to come along and catch hold of him, while good luck is that which comes to the man who gets up and does something, *i.e.*, the man who makes his work count by diligent application of the business principles to the principal business of his life.

In regard to Glenbrook Farm, I should say there are no mysteries in connection with the management; every condition which contributes to its success are available to others. It is the first three or four years which test the stability of such undertakings, and those who can negotiate that period, are almost assured of success.

In conclusion, I should state that it was with difficulty I prevailed on Mr. McComb to allow the place to be described, his fears being that the publicity given to the farm may increase the visitors to an extent which might interfere with the routine of the place. A few visitors are, however, always welcome, and especially so if they abstain from putting the stereotyped query, "Does it pay?"

METEOROLOGICAL BUREAU, No. 4 DIVISION,
NEW SOUTH WALES.

Weather Conditions during December, 1907.

S. WILSON,
Divisional Officer.

THE month opened with an extensive monsoonal disturbance covering the whole of the continent, and which on the 3rd developed a cyclonic centre over the south-eastern portion of the State. These conditions resulted in light to moderate rainfall, associated with thunderstorms over the Coast and Tablelands, Central and South-western Slopes, parts of Riverina, and as far west as Louth, on the Darling River. The heaviest falls were—Port Macquarie, 85; Candelo, 72; Bendemeer, 63; Uralla, 60; and Tenterfield, 58 points; the remaining totals ranged from a few points to half an inch.

The cyclonic disturbance passed off the coast on the 5th, and was superseded by a high pressure of small dimensions, under the influence of which, however, no rainfall was recorded over New South Wales, except at Gabo, with 6 points.

A narrow tongue of low pressure which appeared over the gold-fields of West Australia on the 5th developed into an energetic disturbance, and on the 6th was centrally situated between Eucla and Fowler's Bay. As it travelled eastward it was accompanied by light to heavy rainfall, associated with thunder over the north-eastern half of the State and in parts of southern districts. The heaviest falls occurred at Werris Creek, with 175 points; Moree, 161; Boggabilla, 132; Byron Bay and Quirindi, each 104; Seal Rocks, 94; Kiama, 80; Coolah, 76; Cape Hawke, 73; and Yetman, 70.

Barometric pressure distribution was comparatively flat and wanting in character between the 10th and 12th, and fine weather ruled generally, with the exception of half a dozen places on the North Coast, where light to heavy rain fell, and two or three stations in the South Coast districts, where light showers were recorded.

On the 13th not a single station reported rainfall, but hot sultry conditions ruled throughout the State, due to the influence of a monsoonal disturbance, which first appeared in the north-west of West Australia on the 12th, and during the ensuing twenty-four hours had expanded eastward. The highest temperatures recorded were—Mogil, with 112 degrees; Bourke, 110; Coonamble, 109; Mungindi and Menindie, each 108; Brewarrina, 107; Moree, Narrabri, and Cobar, each 106; Collarendabri, Cudgellico, Dubbo,

Grafton, and Quambone, each 105; Pilliga, 104; Bingara, Gunnedah, Broken Hill, and Maitland, 102 degrees; and Euston, Walgett, and Warialda, 101 degrees.

On the 14th an extensive low pressure was shown, which covered the greater part of Eastern Australia. This disturbance had two centres, one situated about Port Augusta, and the other over Hobart. As the result of these conditions, which prevailed until the 20th, rain, accompanied by thunder—and in some instances hail—fell over the larger portion of the State. Some good totals in the aggregate—several of them exceeding 4 inches—were recorded on Northern Plains, Slopes, and Tablelands, and upwards of 2 inches in Eastern Riverina, South-western Slopes, and Southern Tablelands. The greatest amounts were—658 at Bendemeer; 606 at Tamworth; 601 at Nundle; Boggabri, 494; Collarendabri, 465; Wee Waa, 462; Pilliga, 438; Bombala, 302; Adelong, 290; Tarcutta, 243; Tumut, 232; Delegate, 230; Nimitybelle, 215; Wagga, 205 points. The unsettled showery weather ceased on the 20th, as the monsoonal disturbance passed off our North Coast, and fine weather ruled during the following twenty-four hours, under the influence of a high pressure.

Excepting at a few stations on the North Coast, where light to moderate rainfall was recorded, the weather continued fine until the 24th, when thundery conditions developed over the far west and southern areas, from a low pressure situated then about Adelaide, which, as it travelled eastward, resulted in good general rainfall, the heaviest totals occurring over the Barwon tributaries, Western Slopes, and extreme South Coast. The distribution of rainfall over the subdivisions of the State during this storm was as follows:—On the North Coast, from 9 to 193 points; Hunter and Manning, 2 to 82 points; Metropolitan area, from 30 to 52 points; on the South Coast, from 20 to 137 points; North-western Slope, from 34 to 210 points; Central-western Slope, from 23 to 104 points; South-western Slope, from 46 to 255 points; Central-western Plain, from 40 to 175 points; North-western Plain, from 21 to 146 points; Riverina, from 9 to 145 points; Western Division, from 25 to 302 points.

Judged as a whole, the rainfall distribution over the greater part of the State during the month of December was satisfactory, and in parts excessive. Some large totals were recorded over the North-west Plain and Slope. Bendemeer had 854 points; Nundle, 807; Tamworth, 713; Boggabri, 673; Narrabri, 657; Millie, 552; and Kiandra, on Southern Tableland, 668 Other totals in Western Districts, although not so large, yet represented amounts which were much in excess of the normal. For instance, Wanaaring, with a total of 312 points, was 257 per cent. above average; Wilcannia's 225 points was 221 per cent. above; and Broken Hill's 188 points represented 185 per cent. above average.

On the other hand the majority of coastal stations fared badly, having percentages which ranged from 8 to 77 per cent. below average. In various

other parts of the State deficiencies were shown. The percentages of rainfall in the south-eastern portion of Western Division, and in Western Riverina, ranged from 19 to 93 per cent. below normal.

The percentage distribution over the various subdivisions of the State during December, 1907, was as follows:—

Division.		Percentages. Above normal.		Below normal.
Over North Coast ...	from ...	50	to	69
,, Hunter and Manning	,, ...	73	,,	45
,, Metropolitan	,, ...	—	..	27 to 55
,, South Coast	,, ..	101	to	70
,, Northern Tableland	,, ...	27	,,	55
,, Central Tableland	,, .	13	,,	63
,, Southern Tableland	,, ...	152	,,	50
,, North-western Slopes	,, ...	232	,,	20
,, Central-western Slopes	,, ...	180	,,	75
,, South-western Slopes	,, ...	167	,,	15
,, North-western Plain	,, .	233 to 16		—
,, Central-western Plain	,, .	111	to	31
,, Riverina	,, ...	127	,,	93
,, Western Division	,,	257	,,	65

The following statement shows a brief comparison of the chief meteorological elements over India, together with Australia, so far as data are available for the month of December, 1907:—

	Departure from normal. Pressure	Departure from normal. Temperature	General Conditions (referring to State as a whole).
	Inch	Degrees.	
India...	- ·01	- 0·3	Very dry.
Sydney	+ ·05	+ 1·0	Moderately dry on parts of coast, elsewhere over State chiefly wet.
Melbourne (Victoria)	- ·02	- 2·4	Moderately dry.

The above table shows pressure and temperature at both India and Melbourne to have been below normal, and weather conditions very dry and moderately dry respectively.

At Sydney, however, pressure and temperature were above normal, with chiefly wet conditions over the State.

Orchard Notes.

W. J. ALLEN.

FEBRUARY.

OWING to the continued dry weather many of the trees in our coastal districts are looking very bad, particularly the old citrus trees, the majority of which are carrying little, if any, fruit; the younger trees, however, are in most cases carrying a fair sprinkling. The dry weather has not affected the grape crop so greatly, and it promises to be up to the average. Apples are light but good, whilst apricots, plums, and peaches have been the worst crops we have had for years—that is, in most places it was light and the fruit undersized.

It will be well this month to keep a close watch over all kinds of trees, and wherever scale of any kind is found use every effort to destroy same, either by fumigating or spraying, using any one of the many mixtures which have been found by previous experience to do the best work. For the destruction of San José scale in deciduous trees there is no better spray for this season of the year than the resin and soda wash, and for citrus trees fumigation is the easiest means of ridding the trees of all scales; but wherever brown scale or white louse are found in the trees it is best to increase by one-fourth the strength of the charge as given in the No. 2 fumigating table published about three years back. Growers who intend to practise fumigation would do well not to treat the trees on hot days, but to do the work on cool days, at night-time, or in the early mornings and evenings. In measuring the size of the tree take the extreme height and width before referring to the table to ascertain the quantities of chemicals to use, and be sure not to add the cyanide to the mixture until after the sulphuric acid and water have been put in the bowl or generator and the latter placed under the tent, then drop in the cyanide and close the tent immediately.

Great care must also be exercised not to allow any of the sulphuric acid to come in contact with either the hands or clothing, as it will make the hands very sore, and if it touches the clothes or tents it will burn holes in them. Never spray with Bordeaux mixture after fumigating.

Keep the cultivator at work this month, and in this way keep down all weeds, as also the land in a fine state of tilth.

Continue to fight the codling moth by picking up and destroying all fruit found underneath the trees and seen to be infested with the moth, and give regular attention to the bandages.

Pick up and destroy all fly-infected fruit.

Where irrigation is practised see that the trees and vines are given a good soaking if they require it, but in most cases during normal seasons vines should not require any further watering, as in the case of raisin grapes it would retard the ripening period, which is precisely what we wish to hasten. It may help dessert varieties intended for marketing late in the fall or early

winter. In every case where trees or vines are watered see that the land is thoroughly cultivated immediately it is dry enough to work.

The early part of the present month is the best time to bud to better varieties all poor and worthless varieties of fruit-trees found growing in the orchard. Do not allow an unprofitable tree to remain there another year. Be sure that the buds used are taken from trees that have borne the very best quality of fruit, and do not forget that in the case of peaches the good canning varieties always find a ready sale at remunerative prices.

Towards the end of the month arrangements should be made for sowing leguminous crops, such as are required for green manuring; and as the fall and winter are the only seasons when such crops can be grown among the trees without robbing them of moisture it is best to sow only such varieties as will make a fair growth during the cooler and cold months. Such crops as grey field peas, tares, &c., are depended on to furnish nitrogen and organic matter to keep the soil in a high state of fertility.

Mr. Luther Burbank's Orchard, California.

Arsenate of Lead Spray for Codling Moth.

THE formula recommended by the Georgia State Board of Entomology (*Bulletin* 19), is as follows:—

Acetate of lead	...	11 oz.
Arsenate of soda	...	4 oz.
Water ...	...	50 gallons.

Dissolve in separate vessels, the lead in 1 gallon water, and the arsenate of soda in 2 gallons water. Use wooden buckets for preference. Pour the arsenate solution into the lead solution. Add to 50 gallons water, and stir well. Ready for use.

Comparative cost—

		s.	d.	
(*a*) 11 oz. acetate of lead, at 6d. per lb.	=	0	4	
4 oz. arsenate of soda, at 6d. per lb.	=	0	1½	
		0	5½	for 50 gallons.

To get the same amount of arsenate of lead per 50 gallons, using Swift's arsenate of lead, you would require—

(*b*) 10 oz. arsenate of lead, at 1s. 3d. per lb. = 9½d. for 50 gallons.

The Victorian formula for arsenite of lead is—

		s.	d.	
(*c*) 1 lb. arsenic, at 1s. 3d. per lb.	=	1	3	
2 lb. carb. soda, at 2d. ,,	=	0	4	
7 lb. acetate of lead, at 6d. per lb.	=	3	6	
		5	1	for 360 gallons.
	or	0	8½	for 50 gallons.

The above formulæ were published in last month's *Gazette*, but as some mistakes in the nomenclature occurred it is reproduced here correctly.

Farm Notes

Hawkesbury District—February.

H. W. POTTS.

In the February issue of the *Gazette* last year, in Farm Notes it was stated: "In point of severity, the drought this season has not been exampled in the history of the oldest inhabitant. It is difficult to instance a single crop, excepting cowpeas, which has not been stunted in growth, and in the majority of cases a complete failure." The drought continues. The state of agriculture in the Valley this year is worse than last. Even the cowpea crops this season are a failure. Farmers, finding the subsoils dried out, have not risked the cost of planting maize and other summer crops. The few who have, have lost heavily, except where the maize stalks have been used as dairy green feed.

We may be favoured with rain this month, as we were last year. It is a risk to take to plant maizes, sorghums, and millets to provide for ensilage and early winter forage. With a late winter the results will be favourable, particularly with varieties that mature rapidly.

In some cases, crops of Red Hogan and Hickory King have been planted, and are just above ground. These will require constant cultivation.

Sorghums.—Given rainfall within a few days, it will be good policy to put in at once sowings of Amber Cane. If there be sufficient moisture to effect germination, it will be essential to follow with shallow cultivation.

The Amber Cane or Planters' Friend varieties are noted for quick growth and hardiness, enabling the plant to resist early frosts. Year after year these crops have provided fodder for stock up to the middle of July.

In the early stages of growth sorghums require more attention than maizes, but when full grown they prove hardier and can be relied on as green feed later in the autumn. In addition to providing a succulent and relishable class of food when other forage is unavailable, the surplus crops can be readily converted into ensilage, also dried as hay. In the latter case it has been used with excellent results, chaffed with other foods.

Cereals.—The main crops have now to be considered, and farming operations conducted to get the land in order. Large areas of last season's land used for crops were turned over, and have lain in fallow throughout the summer.

Cultivation should be pursued during the month to get the soil into good tilth, ready for sowing the early winter crops of oats, wheats, and barleys, with or without vetches, the aim being to get the seed sown in order to take advantage of the earliest rainfall and secure green feed for winter.

Lucerne.—It is well to make further provision for extending the growth of lucerne, and whilst this month is unsuitable for sowing, yet advantage may be taken to get the land in readiness by ploughing and top-dressing with gypsum, at the rate of half a ton per acre.

Millets.—The last crop of Hungarian or White French millet may be sown in the early part of the month, provided there is sufficient moisture in the soil to encourage germination. It is still possible to obtain a green forage crop in from sixty to seventy days.

Cattle Cabbage, Kohl-Rabi, and Kale.—The soil may now be got in readiness for these excellent crops. If farmyard manure be available, it is always the best fertiliser, otherwise use a complete manure of superphosphate, potash, and sulphate of ammonia.

Potatoes.—The last crop did not provide enough tubers for seed, and may be regarded as a failure. The autumn crop ought to be planted during the next three weeks.

Rape.—Always providing we get rain, then an early series of sowings of rape may be made.

Jerseys for Dairying.

Milk Yields of the Melbourne (Imp.) Strain.

M. A. O'CALLAGHAN.

There are at the Wagga Experimental Farm, Riverina, a number of superior young Jerseys; and as evidence of the ability of this breed of cattle to yield good quantities of rich milk under conditions of small rai fall, the following yields are given: –

	weeks.	lb.
Hawthorn ...	56	6,420
Enid	50	5,509
Wonga ..	55	4,484
Wilga ..	52	5,904
Doreen ...	51	5,148
Clover ..	51	4,094
Joan ...	51	6,934

All but the last cow are pure-bred Jerseys, and are by the bull Colleen's Golden Lad, who is by Melbourne (imp.), from Colleen (imp.). These are excellent yields for Jersey cows on their first calf, and it proves conclusively that the Melbourne strain of Jerseys is a heavy-milking one. Melbourne, though 13 years old, is still doing stud duty at the Berry Stud Farm.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of February.

Vegetables.

The month of February is generally one of the most trying in the year, and if dry, vegetable growing needs a good deal of patient work if a large supply is needed. The main difficulty lies in the necessity for watering almost everything, so that, if the water supply is short, only a few vegetables can be produced. If the month should happen to be very wet, there is sure to be difficulty with weeds of many kinds, which luxuriate in hot, moist weather, especially in good soil, along the coast. All these difficulties, however, can be surmounted, to a great extent, by regular attention to work.

The use of considerable quantities of farm-yard manure and organic matters will prove invaluable in districts where the rainfall is scanty, both dug into the ground and used as mulch.

Bean, French or Kidney.—In the warm districts of the State a few rows should be sown, if the soil is not very dry. It will probably be too late to sow in the very cold districts, for the plant cannot stand frost. Plants that have ceased to bear should be pulled up to make room for some other kind of vegetable. Old withered plants of beans or peas, when allowed to remain, give the vegetable garden a most miserable neglected appearance, besides taking up space that might be producing something useful. Every grower of vegetables should strive to keep his garden tidy and make it worth looking at. If this be done the place will become more and more interesting and profitable.

Bean, Broad.—This vegetable has been in cultivation from the most remote times—thousands of years before the Christian era. The soil best suited to it is a heavy clay loam, although it will grow and bear well in almost any kind of soil. It would not be advisable to sow to any great extent during the present month. Dig the ground well, and if it is poor, apply plenty of horse or cow dung, and if this has been well rotted, all the better. If artificial manure is used, apply little or no sulphate of ammonia or nitrate of soda. Use bone-dust or superphosphate of lime and potash. Sow in rows from 2 feet to 3 feet apart, according to the variety, for the dwarf-growing kinds may be sown closer together than the tall. The seed should be sown about 4 or 5 inches apart in the rows.

Beet, Red.—Sow a row or two of this useful vegetable. Thin out well any plants that are coming up from previous sowings.

Beet, Silver.—Sow a little seed in ground that has been well manured—that is, if the soil is not naturally sufficiently rich without it, which is seldom the case.

Borecole or Kale.—It is doubtful whether this vegetable is worth troubling about, when so many other kinds of the cabbage family can easily be grown in the State. It will succeed best in the coolest districts. Seed may be sown in beds or boxes like cabbage, and the seedlings afterwards transplanted. It prefers a rather stiff soil, but may be grown successfully in almost any garden.

Broccoli.—Seed may be sown in the same way as cabbage seed, and the seedlings afterwards transplanted, bearing in mind the rule that the richer the soil the wider apart the plants. Plants available from previous sowing may be planted out.

Cabbage, Brussels Sprouts, Cauliflower, and *Savoy* may be planted out if well-grown seedlings are available. Seed also may be sown, and care should be taken not to sow it too thick in the drills.

Celery.—Sow a pinch or so of seed in order to have plants available when required. It should be remembered that celery requires a great deal of moisture during its growth, for its native localities are wet and marshy places. Plant out a few well-grown seedlings in well-manured ground. Make shallow trenches so that water and liquid manure when applied will not run to waste. It may be mentioned that, although the plant requires plenty of water during its growth, it may be possible to over-water, whereby the result is a loss of flavour. The proper quantity to apply can only be learned by experience, and anyone who will take an interest in the gardening work will soon learn. The best manure to use for celery is the droppings of farm animals, mixed well with the soil when the ground is being prepared. If anyone wishes to try the common old method of growing and blanching this plant, he should dig out trenches 12 inches deep or more, and about 16 inches wide, the soil taken out of the trench to be spread along the top of the bank. At the bottom of the trench dig in a good supply of manure and plant strong, stocky young seedlings, 9 inches apart, in the middle of the trench. The seedlings should be moved from the seed-bed with care, and the roots injured as little as can be avoided. When the plants have attained a good growth, they can be earthed up so as to make the stalks white, or "blanched," which is the ordinary term used. The soil must not be allowed to drop into the centre of the leaves, or they will probably decay or become injured and unfit for use. Some gardeners use paper round the stalks; but this is unnecessary if the stalks are held together, and care is taken when earthing-up is done.

Cress and Mustard.—Sow a little seed every now and then in a small, well-manured piece of ground. The plants will need water frequently when they come up, and subsequently.

Endive.—Seed may be sown in a seed-bed or in boxes, and when the seedlings have grown large enough to handle they may be transplanted. This plant is best suited to a warm climate. Plant out about 1 foot or 15 inches apart. When the plants are pretty well full grown, the leaves should be tied together, so that the inner one may become white and tender.

Herbs.—Seeds of all kinds may be sown. These useful plants should not be forgotten. Sow in pots, boxes, or seed-beds, and afterwards transplant. Parsley should be transplanted whilst it is very young, for it soon sends out a long tap-root, which had better not be broken.

Lettuce.—Sow seed in the seed-bed for future planting out. If any strong young lettuces are to be had, plant them out in rich, well-dug ground. It is very often the custom to sow lettuce seed, at this season of the year, in rows where the plants are to grow, and not transplant, because the lettuces are very likely to run quickly to seed.

Leek.—This time of year is about the best season to sow seed largely of leeks. Prepare a seed-bed and sow in rows. When the plants are about 6 or 8 inches in height, they may be transplanted to a bed made exceedingly rich with good farm-yard manure. Make shallow trenches and plant in rows about 18 inches apart, the leeks to stand about 9 inches from each other. Water and liquid manure will be needed often if it is desired to grow the best of plants.

Peas.—In cool, moist climates, sow a few rows of this excellent vegetable. Prepare the ground well, and, if it is poor, apply a good deal of farm-yard manure.

Radish.—Sow a little seed occasionally to keep up a supply.

Sea Kale.—Sow a little seed in a seed-bed and afterwards transplant the seedlings, just as cabbages are planted, to well-manured, deeply-prepared ground. When the plants attain a good size, they need to be covered and blanched, and for this purpose special kinds of pots are made; but dead leaves, manures with plenty of straw, boxes, or something to keep the light away from the plants, will answer.

Spinach.—Sow seed in drills in rich, rather moist, but well-drained soil. Let the drills be about 18 inches apart, and when the seedlings appear, thin them out well. This is a very good vegetable, and well worth growing.

Shallots and Garlick.—Plant out in drills, about 1 foot apart, as much of this useful vegetable as is likely to be required. The bulbs or cloves can be purchased from any seedsman. Dig the ground deep and manure it well. When planting, just press the bulb firmly into the soil. Keep the plants free from weeds as they grow. *Garlic* may be planted out in the same way as the above, taking care to divide the bulbs.

Flowers.

March is a good time of the year to plant out many kinds of bulbs, and no one should be without daffodils, crocuses, snowdrops, sparaxis, ixias, hyacinths, &c. These may all be planted, and the earlier the better—that is, if

the soil has been prepared for them. They can be planted singly, in clumps, or in rows, or in any way in which you please or circumstances may require. You cannot do wrong in planting bulbs to almost any extent, for they are so pretty and ornamental that they cannot fail to please everyone, and no plants can be more easily grown. Daffodils, hyacinths, tulips, crocuses, snowdrops, and snowflakes will come to the greatest perfection in the cool climates in this State, but they will give great satisfaction almost everywhere. After planting, spread a mulch of cow or horse dung over them. The depths for planting should vary with size and variety, the largest from 3 to 4 inches, and the smallest about an inch. It would be advisable to have the ground properly drained, for bulbs will not succeed in ground too wet. All the charming little flowers, dear to almost everyone—daisies, cowslips, primroses, polyanthuses, auriculas, pansies, and so on—may be planted during the latter part of the month. Violets, too, should not be forgotten, and they, especially the double varieties, come to the greatest perfection in our coolest climates, although the singles succeed fairly well almost everywhere, if there is sufficient moisture for them. Sow some seeds of ten-week stocks in a bed, or in boxes, for transplanting when the seedlings are large enough to move. The plants will flower in the spring. All sorts of hardy annuals and perennials may be sown, either in the garden where they are to flower or in boxes or pots. It will probably be the best way to sow in boxes or pots, and afterwards transplant, because seedlings in the garden whilst very young and tender are so liable to injury from insects and other causes. As numbers of the readers of these directions may be new to flower-gardening, and the names are not familiar, they are advised to obtain seeds of some or all of the following:—*Anagallis grandiflora,* or Pimpernel; *Anchusa capensis,* hardy perennial; Anterrhinum, or Snapdragon, of varieties, hardy perennials; Aquilegea, or Columbine, of various kinds, hardy perennials; *Asperula odorata,* or Woodruff, a very old English flower, hardy perennial; Auriculas of varieties, hardy annuals; Campanulas of variety, hardy perennials; Candytuft of varieties; Coreopsis of varieties, hardy annuals; Carnations of varieties, hardy perennials; Centaurea of varieties, hardy annuals; Annual Chrysanthemums of varieties; Clarkia of varieties, hardy annuals; Cosmos of varieties, hardy annuals; Coreopsis of varieties, especially Grandiflora, hardy biennials; *Dianthus Heddewigii;* Delphinium, or Larkspur, of varieties; Digitalis, or Foxglove; Eschscholtzia, hardy perennial, of varieties; Freesia bulb, but easily raised from seed, will flower the first season; *Hedysarum coronarium,* French Honeysuckle, hardy perennial; Gaillardia of varieties; Godetia of varieties, hardy annuals, extremely pretty free-flowering plants; *Senecio elegans,* or Jacobia, hardy annuals; Everlasting Pea; Sweet Pea of varieties; Lobelia of varieties, hardy annuals; Perennial Lobelia, Cardinalis; *Linum grandiflorum rubrum nigella hispanica,* or Love in a Mist, hardy annual; Lupines of varieties, hardy annuals; French and African Marigolds; Mignonette, hardy annual; Nemophila, hardy annual; Nasturtium of

varieties; Pansies of varieties, hardy annuals; Penstemon of varieties, hardy perennials; *Phlox Drummondii* of varieties, some of the prettiest of annuals; Poppies of varieties, hardy annuals; Perennial Poppies; Polyanthus, hardy perennial; Scabious of varieties, hardy perennial; Sweet Sultan, hardy annual; Sweet William; and Wallflower.

The seeds should be sown with care on a finely-prepared surface of soil which has been made fine as well as level. Sow very thin and barely cover with soil. Keep moist, but not too damp. When strong enough, plant in the garden.

Cuttings of roses, pelargoniums, fuchsias, geraniums, verbenas, and many other plants will strike easily this month. Shade well after planting, and keep them moist, but not too damp.

SEASONABLE NOTES.

GEO. L. SUTTON,
Wheat Experimentalist.

WITH the object of relieving some of the pressure inseparable from a very busy time, the seed wheat intended for this season's planting may be "pickled" with bluestone, or with bluestone and lime-water, during the present month, with as much safety as if "pickled" just before sowing, provided the seed is thoroughly dried immediately after being treated.

Though the benefit of dipping in lime-water after treatment with bluestone is evident and distinct, THE ABSOLUTE NECESSITY FOR THOROUGHLY DRYING THE GRAIN AFTER TREATMENT MUST BE STRONGLY EMPHASISED. If the wheat so treated is thoroughly dried, the majority of drills on the market will sow the grain without injuring it, though even when "bone" dry it does not run as freely through the drill as grain which has been treated with bluestone only. On many farms, it is the practice to plant seed which is not thoroughly dried after treatment, but which is only partially dry as the result of draining for several hours. Whilst this method is satisfactory when formalin or bluestone is used, it *cannot* be adopted with the bluestone-lime-water method. Trials made last year at Cowra clearly showed that wheat which had been allowed to drain for sixteen hours, after being treated with bluestone and lime-water, choked the drill, though this same drill had previously sown, with the utmost satisfaction, some thirty odd varieties which had been treated in exactly the same way, with the exception that

they had been thoroughly dried after treatment. It is questionable whether there is any drill on the market which will sow the partially-dried grain without damaging it.

Unless the grower is thoroughly prepared to dry his treated seed, it will be far better for him to forego the advantages derived from treating with lime-water, and to use bluestone only, with its attendant disadvantages of seed destroyed and of plants of lessened vigour, for the loss resulting from them will be far less than the loss incurred through attempting to drill grain partially dried after its treatment with bluestone and lime-water.

The result of the trials to determine the value of a mixture of bluestone and lime-water (Bordeaux mixture) as a preventive of smut are not conclusive enough to warrant its use being recommended. Though more troublesome, the double treatment cannot yet be discarded.

Growers who intend to use formalin—and it is probably a better preventive of smut than bluestone—are cautioned against treating the seed until just before it is required, or against using it when the ground is too dry for the seed to germinate.

At the commencement of another season the advantages of the plan suggested last year (*Agricultural Gazette,* March, 1907: "Seasonable Notes"), of growing the seed required for the farm in a special plot, are more than ever apparent. The adoption, by careful farmers, of the plan then suggested is now strongly recommended. There is no doubt as to its practical and economic value. Apart from the saving—some 95 per cent.—which must be effected in the cost of treating the seed wheat of the farm for the prevention of smut, its adoption must result in an increased average yield, as the result of planting a better class of seed. To obtain the very best results, the special area set aside should be treated as a stud plot, and should be planted with the best seed obtainable, either from selections made on the farm itself, or purchased from growers who make a specialty of raising seed wheat; just as sheep-men, either by breeding or by purchase, regularly obtain stud rams to improve their flocks.

The advantages accruing from the adoption of such a plan are so great that it is believed its adoption by one or more progressive farmers in a district will lead to it becoming general; and when this is brought about, the average wheat-yield of the State will be raised.

Mules.

GEORGE VALDER.

For some years past South Africa has imported mules in very large numbers. The 1904 Census shows that in Cape Colony alone there were then employed some 64,433 mules and 100,470 donkeys. The South African farmer finds that the mule is much hardier than the horse, that he is not so liable to disease, and that he can thrive upon much coarser fare. He is therefore employing mules for almost all classes of farm work. In many districts horses cannot be profitably worked, in consequence of the prevalence of certain diseases to which they are liable, and therefore mules are used in their place. In other districts live-stock diseases are so troublesome that even the mule cannot be profitably employed, and the still more hardy donkey takes his place. In many parts of South Africa it is quite a common thing to see teams of sixteen, eighteen, or even twenty-four donkeys bringing into town a waggon loaded with farm produce.

The Customs returns for the year 1906 show that, in spite of the depressed state of trade, the demand for mules continues, no less than 5,538 mules, of a value of £67,514, being imported. Nearly the whole of these mules were obtained from Argentina, the following being the numbers obtained from each country, and the value:—

Country.	Mules.	Value.
		£
Argentine Republic	5,173	55,451
United States	165	5,050
Canada	200	7,013
Total	5,538	67,514

It will be seen that the average value given is about £12 per head. This price is f.o.b. port of embarkation.

The mules imported from North America are usually of the heavy-draught type, which bring from 60 to 100 guineas per pair in Cape Town. These are used for town work. For the farms, the lighter and cheaper South American mule is preferred. The prices quoted for these, delivered at South African ports, are as follows:—

	Broken.	Unbroken.
Mules, 2 to 7 years, 12½ hands	£13 10s.	£12 10s.
,, 3 to 7 ,, 13 ,, ...	£14 10s.	£13 10s.
,, 3 to 7 ,, 13½ ,, ...	£15.	£14.
,, 3 to 7 ,, 14 ,, ...	£19 10s.	£18 10s.

All mules are guaranteed to be as represented, and to be delivered in good condition. No whites or piebalds will be sent.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Coramba P., A., and H. Society	H. Hindmarsh	Feb. 5, 6
Wollongong A., H., and I. Association	J. Beatson	,, 6, 7, 8
Alstonville A. Society	Wm. W. Monaghan	,, 12, 13
Gunning P., A., and I. Society	W. T. Plumb	,, 13, 14
Guyra P. A. and H. Association	P. N. Stevenson	,, 18, 19
Pambula A., H., and P. Society	J. B. Wilkins	,, 19, 20
Kangaroo Valley A. and H. Association	E. G. Wilkinson	,, 20, 21
Southern New England, Uralla	W. C. McCrossin	,, 25, 26
Ulladulla A. and H. Association	C. A. Buchan	,, 26, 27
Robertson A. and H. Association	A. G. Ferguson	,, 27, 28
Manning River A. and H. Association, Taree	S. Whitehead	,, 27, 28
Newcastle A., H., and I. Association	C. W. Donnelly	,, 27, 28, 29
Bega A., P., and H. Society	W. A. Züegel	Mar. 4, 5
Braidwood P., A., and H. Association	L. Chapman	,, 4, 5
Yass P. and A. Association	Will. Thomson	,, 4, 5
Tenterfield P., A., and Mining Society	F. W. Hoskin	,, 4, 5, 6
Berrima A., H., and I. Society, Moss Vale	J. Cullen	,, 5, 6, 7
Wyong Agricultural Association	W. Baldwin	,, 6, 7
Bombala Exhibition Society	W. G. Tweedie	,, 10, 11
Bangalow A. and I. Society	W. H. Reading	,, 10, 11, 12
Glen Innes and Central New England P. and A. Ass.	Geo. A. Priest	,, 10, 11, 12
Dapto, Unanderra, A. and H. Society	Geo. Lindsay	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12
Nambucca A., H., and I. Association, Bowraville	Clifford Moseley	,, 12, 13
Nepean A., H., and I., Penrith	Percy Smith	,, 12, 13
Port Macquarie and Hastings District A. and H. Soc.	Thos. Dick	,, 12, 13
Blayney A. and P. Association	E. J. Dann	,, 17, 18
Gloucester Agricultural Society	Edward Rye	,, 18, 19
Queanbeyan P. and H. Association	E. O. Hincksman	,, 18, 19
Cobargo A., P., and H. Society	T. Kennelly	,, 18, 19
Macleay A., H., and I. Association, Kempsey	E. Weeks	,, 18, 19, 20
Crookwell A., P., and H. Society	C. T. Clifton	,, 19, 20
Gundagai P. and A. Society	A. Elworthy	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 24, 25, 26
Tamworth Agricultural Association	J. R. Wood	,, 24, 25, 26
Hunter River A. and H. Association (West Maitland)	C. J. H. King	,, 24 to 27
Moruya A. and P. Society	John Jeffery	,, 25, 26
Orange A. and P. Association	W. Tanner	,, 25, 26, 27
Berry Agricultural Association	A. J. Colley	,, 25, 26, 27

Society.	Secretary.	Date.
Clarence P. and A. Society, Grafton	Thos. Bawden ...	Apl. 1, 2
Durham A. and H. Association (Dungog)	C. E. Grant ...	,, 1, 2
Warialda P. and A. Association	W. B. Geddes ...	,, 1, 2, 3
Bathurst A., H., and P.	W. G. Thompson..	,, 1, 2, 3
Walcha P. and A. Association	S. Hargraves ...	,, 2, 3
Campbelltown A., H., and I. Society	Fred. Sheather ...	,, 7, 8
Lower Clarence A. Society, Maclean	G. Davis	,, 7, 8
Moree P. and A. Society...	D. E. Kirby ...	,, 7, 8, 9
Mudgee A. Society	H. Lamerton ...	,, 7, 8, 9
Cooma P. and A. Association	C. J. Walmsley ...	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy ...	,, 8, 9, 10
Upper Manning A., P., and H. Ass.	D. Stewart, jun. ...	,, 9, 10
The Royal Agricultural Society of N.S.W.	H. M. Somer ...	,, 14 to 22
Dubbo P. A. and H. Association	F. Weston ...	May 6, 7
The Central Australian P. and A. Ass., Bourke ...	G. W. Tull ...	,, 20, 21
Nyngan and District P. and A. Association	R. H. A. Lyne ...	,, 27, 28
New South Wales Sheep Breeders' Association .	A. H. Prince ...	June 24 to 27
Deniliquin P. and A. Society	L. Harrison ...	July 18, 19
Forbes P., A., and H. Association	N. A. Read	Aug. 12, 13
Murrumbidgee P. and A. Association	A. F. D. White ...	,, 25, 26, 27
Young P. and A. Association	G. S. Whiteman ...	,, 8, 9, 10
Germanton P. and A. Society	J. Stewart ...	Sept. 9, 10
Cootamundra A., P., H., and I. Association... ...	T. Williams ...	,, 15, 16

Information invited from Wheat-Growers.

The Wheat Experimentalist of the Agricultural Department is desirous of obtaining some definite data as to the minimum amount of rain required in different districts to produce a profitable crop of wheat under farmers' conditions. Last season being unfavourable generally, would appear to be a suitable period for furnishing such information, and the Minister for Agriculture invites such of our readers who are wheat-growers, and have kept rainfall records, to assist the Department by furnishing the following details with regard to the different areas cropped—(1) Area harvested, (2) total yield, (3) variety of wheat, (4) date planted, (5) date harvested, (6) how harvested, (7) details of rainfall during the year, (8) any other information likely to be of interest. The particulars should be sent as early as convenient to the Director of Agriculture.

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Agricultural Gazette of New South Wales.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from page 8.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

IX.

(15.) *P. longifolia*, Roxb. "Emodi Pine." Himalaya, India.

A tall tree, remarkable for its beautiful, long, pendulous leaves. It does fairly well in the Sydney district, and should be well tried in the coastal districts and eastern slopes.

L 17, 29, 35 (Sydney Botanic Gardens).

(16.) *P. Massoniana*, Lambert.

China. Timber used for tea-boxes. This is a tree which does fairly well in the Sydney district, and if it be given a fair chance, with fair soil there is no doubt it will prove a useful Pine for New South Wales.

L 7 (Sydney Botanic Gardens).

(17.) *P. mitis*, Michx. (Syn. *P. echinata*, Miller) "Short-leaved Pine." "Soft-leaved Pine" (England), and "Yellow Pine" (United States). Sargent, t 587 (as *P. echinata*, Miller).

Native of the Eastern United States, where it is widely diffused. It yields a valuable timber, and has the merit of rapidly reafforesting worn-out fields, thus enabling a crop of timber to be raised while the soil has an opportunity of recovering its fertility.

Professor B. E. Fernow, the eminent exponent of forestry in the United States, speaks of this species as being one of the best pines of that country.

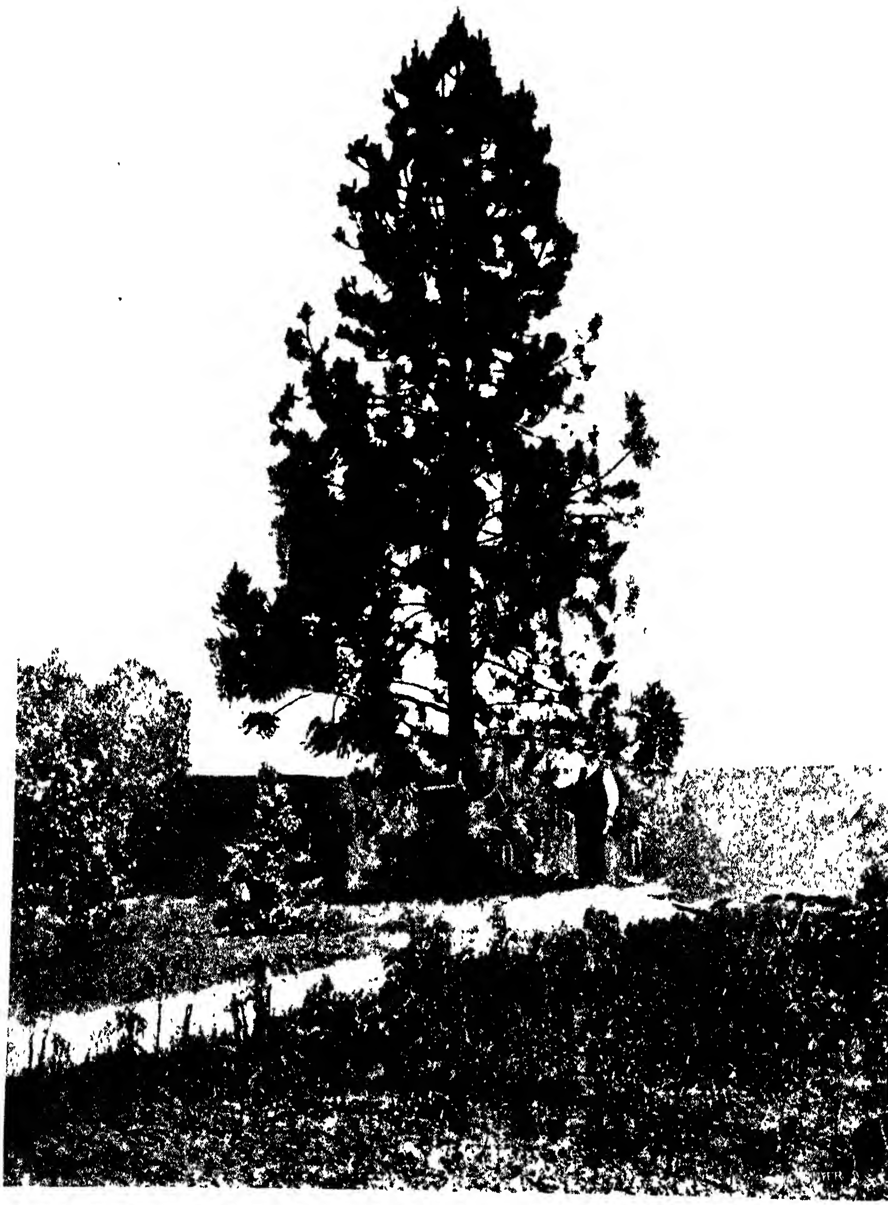
For that reason it should well be tried in this State. It has been tried in Sydney and has not done well so far, but residents in the coldest districts should experiment with it.

L 15 b (Sydney Botanic Gardens).

(18.) *P. Montezumæ*, Lambert.

The common Pine of the mountains and highlands of Mexico, between the 17th and 25th parallels of north latitude. It is a beautiful species, very distinct, tender in Britain and Ireland, and may be expected to flourish in many parts of New South Wales.

It is not in the Sydney Botanic Gardens at present.



Pinus longifolia, Roxb.
State Nursery, Campbelltown.

(19.) *P. muricata*, D. Don. "Bishop's Pine" (corruption of Obispo Pine). "Prickle-coned Pine." Sargent, tt. 585, 586.

A maritime Pine found wild only in the vicinity of the Californian coast exposed to the fogs and winds of the Pacific Ocean.

Our experience shows that this Pine has not been a success in the Sydney Botanic Gardens. It is, however, worthy of additional experiments, and should be thoroughly tested along the South Coast. It is a small-leaved, dense-growing species, and its real value for New South Wales remains to be ascertained.

(20.) *P. palustris*, Miller. "Long-leaved Pine," "Southern Pitch Pine," "Southern Yellow Pine," "Yellow Broom Pine." Sargent, tt. 589, 590.

A medium sized or tall tree.

Pinus palustris is almost the sole ingredient of the immense forests stretching uninterruptedly along the Atlantic seaboard from south-east Virginia to the Everglades in Florida, and also along the northern littoral of the Gulf of Mexico as far as Trinity Valley in South Texas. This belt, known in the United States as the Southern "Pine Barrens," varies from 80 to 125 miles in breadth in the Atlantic States, but is much narrower along the Gulf coast; it is estimated to have once covered upwards of 130,000 square miles, an area greater than that of Great Britain and Ireland, and to have represented an amount of wealth which, if properly husbanded, would have made the States of South Carolina and Georgia among the richest in the Union. But, "invaded from every direction by the axe, a prey to fires which weaken the mature trees and destroy the tender saplings, wasted by the pasturage of domestic animals, and destroyed for the doubtful profits of the turpentine industry, the forests of Long-leaved Pines appear hopelessly doomed to lose their commercial importance at no distant day." *

It is by far the most valuable Pine of the Atlantic States, and still the most abundant. It supplies nearly the whole of the turpentine, pitch, tar and resin of American commerce as well as for home consumption, and its timber is used for all sorts of constructive purposes, including ship-building, house carpentry, fencing, railway ties, etc. (*Veitch's Manual*, p. 353.)

See "Waste in Logging Southern Yellow Pine," by J. Girvin Peters, *Year-book, Dept. Agric. U.S.A.*, 1905.

Prof. B. E. Fernow says it is one of the best Pines of the United States.

It is too tender for Great Britain, and is a species well worthy of attention in coastal New South Wales. It promises well; for example, there is a fine specimen in the National Park, sent out by the Botanic Gardens, Sydney, and further tests are being made in the Botanic Gardens.

(21.) *P. patula*, Schiede.

A large tree, native of Central Mexico. It is "one of the most ornamental of Pines," rather tender for Great Britain, and should have more extensive trial here. Up to the present time it has shown itself a rather slow grower in the Sydney Botanic Gardens, but is full of promise. It was distributed by the Sydney Botanic Gardens some years ago, but reports are not available as to results.

L 32 (Sydney Botanic Gardens).

(22.) *P. Pinaster*, Sol. (Syn. *P. maritima*, Lam.). "Cluster Pine" or "Maritime Pine."

South Europe and the Levant.

Figured and described in Bentley and Trimen's *Medicinal Plants*.

* Silva of North America, xi, 156.

An excellent Pine for sea-coast planting. It is the celebrated Pine of the "Landes" of South-western France, so extensively planted to reclaim the sand-dunes, and valuable because of the yield of Turpentine. This tree spreads spontaneously in the Sydney district.

It is undoubtedly a valuable tree for the sandy coast districts. While very useful, it is, however, not one of the most ornamental species.

L 30 (Sydney Botanic Gardens).

(23.) *P. pinea*, L. "Stone Pine." The "Parasol Pine" of the French, owing to the flat tops of mature tr es. Often called "Umbrella Pine."

Pinus penea, L.
State Nursery, Campbelltown.

Mediterranean region. This valuable tree does well in the Sydney district and in the coastal district generally. It attains a very large size, and is one of the Pines which is worthy of attention in any scheme of Australian forestry, involving artificial planting. Because of its flat top it is the most easily recognised of all Pines.

U 3, L 29 a (Sydney Botanic Gardens).

(24.) *P. ponderosa*, Dougl. "Western Yellow Pine." "Bull Pine." Sargent, tt. 560–64.

The western Yellow Pine or *Pinus ponderosa* is the most widely distributed Pine-tree of the mountain forests of western North America, where it spreads from the interior of British Columbia from about latitude 57° N. southwards to Mexico and eastwards to northern Nebraska, the foot-hills of the Rocky Mountains of Colorado and western Texas. Usually an inhabitant of dry elevated slopes, where it often forms open forests of great extent, it flourishes also on the western slopes of the Sierra Nevada in the comparatively humid climate of northern California, where it attains its largest size; and in California it grows occasionally in wet and swampy ground. . . .

. . A tree of such enormous range over a region of so many different climates has naturally developed many forms, and no other American Pine-tree varies more in size and habit, in the character of the bark, length of leaves and size of cones. Sometimes it is 250 feet high, with a trunk 12 feet in diameter, covered with bright cinnamon-red bark broken into great plates; sometimes it attains with a difficulty a height of 50 feet, and its bark is nearly black and deeply furrowed. Such variations in the character of the bark are not always due to climate, and individuals with the red bark of the Californian tree and the black bark of the inhabitant of the arid slopes of the Colorado mountains stand side by side in northern Arizona, to the discouragement of the botanist anxious to understand this tree and the causes of its variations. One hundred photographs would not be too many to illustrate the appearance of *Pinus ponderosa* in the different parts of the country which it inhabits; and an attempt to describe the different forms with any words at our command would be hopeless. (*Veitch's Manual*, pp. 364–5.)

Prof. B. E. Fernow says that this is one of the best timber Pines of the United States, and that it is well adapted to dry, windy, exposed places. It is evidently a hardy Pine.

This is a species not a great success in Sydney, but hardy in many parts of Britain, but I recommend seed for New South Wales to be, as far as possible, obtained from Californian trees.

The wood of *Pinus ponderosa* varies greatly in quality, strength and durability in different parts of the region over which it is distributed; the wood of the western tree is heavy, hard, strong, and fine-grained, but not durable in contact with the soil. (*Veitch's Manual*, p. 366).

See also "Forest Planting Leaflet," Forest Service Circular 72, U.S. Dept. Agriculture.

L. 30 (Sydney Botanic Gardens).

Var. *Jeffreyi* (*P. Jeffreyi*, Murr.) "Jeffrey Pine." California. See *Gard. Chron.* 1889, v. 361, f. 65.

Distinguished in Oregon from the typical *Pinus ponderosa* by its more pungently aromatic resinous secretions, its stiffer and more elastic leaves, persistent for a longer time; its yellow-green staminate flowers, and its larger cones, armed with stronger reflexed prickles. (*Veitch's Manual*, p. 364.)

On the mountain above the Yosemite Valley is a wonderful forest of Pine-trees, composed of *P. ponderosa var. Jeffreyi;* the trees stand sometimes close together, sometimes at a considerable distance apart; they are often 250 to 300 feet high, their massive trunks 10 to 12 feet in diameter, and free of branches, except near the top of the tree. There are not many things more impressive or more beautiful than these trunks; the bark is excessively thick, and broken by deep fissures into great armour-like plates, across which the sunlight, as it flickers down through the scanty canopy above, casts long shadows. (*Veitch's Manual*, p. 366.)

Pinus ponderosa, Dougl.
State Nursery, Campbelltown.

Prof. B. E. Fernow says this is a second-class Pine in the United States.

We have had but limited experience of this Pine in Sydney, but sufficient to show that it will thrive here, and it can be recommended for a thorough trial. It does fairly well at Campbelltown.

(25.) *P. pyrenaica*, Lapeyrouse. The "Pyreneean Pine."

The geographical range of *Pinus pyrenaica* may be stated in general terms to extend through the Mediterranean region, from the Pyrenees to the Levant and Asia Minor, whence it spreads eastwards through northern Persia into Afghanistan as far as Herat.* It occurs on many of the mountain ranges throughout this region at altitudes of 2,000 to 6,000 feet. (*Veitch's Manual*, p. 368.)

This should be a useful Pine for New South Wales, not only for the Coast districts, but for considerable elevations on the Coast range.

In Asia Minor, where it forms pure forests, it is much esteemed, not only as a timber tree, but also as a yielder of turpentine.

(26.) *P. radiata*, Don. (Syn. *P. insignis*, Douglas.) The "Monterey Pine," of California. Sargent, tt. 573–4.

A stately tree, of 80–100 feet.

Pinus radiata inhabits a strip of coast-land in South California, extending for about 150 miles from Pescadero to San Simeon Bay, spreading inland only a few miles. It also grows in a peculiar form on Santa Rosa and Santa Cruz, of the Santa Barbara group of islets off the coast of South California, and in Guadalupe, off the coast of Lower California. The wood is light, soft, and brittle, and is used only for fuel.† (*Veitch's Manual*, p. 370.) . . . . . .

Pinus radiata is much cultivated in Australia and New Zealand, where its growth is still more rapid than in Great Britain. In South California it is planted for fixing the sand dunes (*op. cit.*).

This is extensively known in New South Wales by its botanical name of *P. insignis*, but it must give way to that of *P. radiata*, which is two years older. It will not be easy to supplant the name *P. insignis* in favour of the rightful one. It is undoubtedly a most useful Pine, being hardy in many climates and soils, and a rapid grower. It is, hence, often grown for shelter and ornament. A drawback is its liability to sudden death.

It has been attacked, in recent years, by the same Coccid which has destroyed *P. halepensis*, but *P. radiata* has a stronger constitution than *P. halepensis* in the coast districts, and hence has not suffered much.

L 8, 15 b (Sydney Botanic Gardens).

(27.) *P. resinosa*, Solander. "Red Pine." "Canadian Pine."

A tall tree, native of the North American continent between the 41st and 48th parallels. It is a useful timber tree, exuding much resin. In the neighbourhood of the North American lakes it thrives best in a dry, sandy soil It can only be expected to do best in cold localities.

This is one of the best Pines of the United States according to Prof. B. E. Fernow, but he states that seed is difficult to obtain. [*See* Forest Planting Leaflet, United States Department Agriculture Forest Service, Circular 60.]

We had it in the Sydney Botanic Gardens, but circumstances required its removal. It did moderately well, and it should be further experimented with. It was not a handsome tree with us, but our experience of it is limited.

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* Boissier. *Flora orientalis*, v. 696. † Sargent, Silva of North America, xi, 104.

Pinus radiata, Don. (commonly known in N.S.W. as *P. insignis*).
State Nursery, Campbelltown.

(28.) *P. rigida*, Mill. "Pitch Pine."

This is one of the second-class Pines of the United States according to Prof. B. E. Fernow.

It is not in the Sydney Botanic Gardens. It should be well tested in the colder districts.

(29.) *P. Sabiniana*, Douglas. "Digger or Bull Pine" of the United States; "Nut Pine" (England). Sargent, tt. 569–70.

A medium-sized tree, inhabiting the foot-hills of California, both of the coast range and of the Sierra Nevada, almost throughout the entire length of the State from north to south, ascending in places on the latter to 4,000 feet above the level of the sea, but usually much lower. It is so unlike any other Pine in habit and aspect, that even amidst the luxuriant coniferous vegetation of California, it forms a distinct feature of the landscape, appearing in the distance more like an Olive tree or a Willow than a Pine. Its loose and widely-branched habit, and its thin, grey, pendulous foliage tufted at the ends of its crooked, straggling branches, render the tree so pervious to light that it affords no shade, but, at the same time, clothes it with pale colouring so distinct that in the distance this Pine can be easily recognised amidst the darker surroundings. (*Veitch's Manual*, p. 376.)

It yields a poor timber, but its large seeds are much esteemed as an article of food by the Indians.

We have many localities in which this remarkable species may be expected to flourish.

We had it in the Sydney Botanic Gardens for a number of years, and was rather a thin-foliaged plant with us. At the same time it should be further experimented with.

(30.) *P. sinensis*, Lamb.

Has never done well in the Sydney Botanic Gardens. It evidently requires a cooler climate and better soil than is available here.

L 17 a (Sydney Botanic Gardens).

(31.) *P. strobus*, L. "White Pine" of the United States.

See a valuable paper by Prof. B. E. Fernow in the "Year-book of Agriculture" (U.S.A.) for 1897, p. 645, where this tree is recommended as being one of the very best timber Pines in the United States.

See also Forest Planting Leaflet, U.S. Dept. Agric., Forest Service, Circular 67.

Not at present in the Sydney Botanic Gardens. Not a handsome species for the Sydney district, but should be well tried in the coldest localities.

(32.) *P. sylvestris*, L.

The name "Scots Pine" has attached itself to this Pine.

Figured and described in Bentley and Trimen's *Medicinal Plants*.

The Scots Pine has a greater geographical distribution than any other Pine, or even of any other species included in the Abietineæ. With the exception of the southern portion of the Balkan peninsula, it is spread over the whole of Europe, including the British Islands, and in Asia it occurs throughout nearly the whole of that part of the continent comprised within the Russian dominions. (*Veitch's Manual*, p. 380.)

See also Forest Planting Leaflet, U.S. Dept. Agric., Forest Service, Circular 68

It is a very valuable Pine for shelter, and also for the multifarious uses to which its timber is put.

It should flourish in the colder parts of New South Wales; the ordinary Scots Pine from northern Europe does not flourish in the coast districts.

(33.) *P. Tæda*, L. "Loblolly Pine." "Old Field Pine."

Figured and described in Bentley and Trimen's ***Medicinal Plants.***

Pinus Tæda is one of the most widely distributed of the Pines inhabiting the Atlantic States of North America. It spreads from Delaware southwards to Florida, and through the Gulf States to Texas. Except in the northern portion of its range where it prefers the low lands adjacent to the Atlantic coast, it takes the place of the southern Pitch Pine, *P. palustris*, inland spreading westwards through South Carolina and Georgia to the Mississippi River. West of the great river, the area covered by it is less extensive, but in western Louisiana and eastern Texas it forms considerable forests, and in Arkansas and the Indian Territory it is the most important timber tree of the country. (*Veitch's Manual*, p. 382).

This is one of the species growing in a warm climate, and it should do well in our coastal districts. In the south-eastern United States it is a rapid grower, but it does not seem to yield a valuable timber, and Professor B E. Fernow says it is one of the most valuable Pines of that country.

Mr. Robert Garrett grows it well at Chatsworth Island.

L 17 (Sydney Botanic Gardens).

(34.) *P. tenuifolia*, Benth.

Guatemala. A handsome long-leaved Pine, with fine needles, as its name denotes. It is certainly a valuable addition to the plants of the Sydney district. Unfortunately the top was blown off the specimen in the Sydney Botanic Gardens, but it is so full of promise that it is hoped that it may be more widely grown.

L 7 (Sydney Botanic Gardens).

(35.) *P. tuberculata*, Gordon. "Knob-cone Pine." Sargent, tt. 575–6.

A medium-sized tree.

Pinus tuberculata inhabits the dry southern and western slopes, fully exposed to the sun, of the mountain ranges, which under various names, extend from south-west Oregon, its northern limit to the San Bernardino mountains in South California In some places it forms pure forests of considerable extent; in others it is more scattered and mixed with other trees; its vertical range is from 1,000 to 5,000 feet above sea-level. The wood is soft, brittle, and cross-grained, and but little used. . . .

Pinus tuberculata is singular among pines in bearing cones when only a few feet high, and which remain on the tree for thirty to forty years, often becoming embedded in the bark, and not opening till the tree dies from local causes, or is destroyed by a forest fire. *P. tuberculata* also has the peculiarity of producing its cones on the main trunk as well as on the branches, giving it a singular appearance, as they are arranged around the stem in almost a circle, usually five though often seven cones composing the circle. (*Veitch's Manual*, page 387.)

This tree will flourish in many parts of New South Wales, and is an interesting species, if it possesses no other merits.

We have had it in the Sydney Botanic Gardens, where it did not thrive, but steps are being taken to obtain further specimens.

(To be continued.)

Potatoes.

R. H. GENNYS,
Glen Innes Experimental Farm.

THE potato (*Solanum tuberosum*) is a native of America, and next to wheat and other valuable cereals, forms a most important food for man.

The potato, as Dr. Langworthy, of America, has stated, is in reality a modified stem—not the root of the plant—being shortened and thickened to serve as a storehouse for reserve material for the propagation of new plants. The flesh makes up the bulk of the potato, and peeling removes the outer and inner skins. The loss of the skin is a much greater loss of nutritive material than is generally thought. Cooking with skins on, more especially when boiled, is generally to be recommended.

The edible portion of the potato is made up of about the following:—

	Per cent.		Per cent.
Water ...	78·3	Carbohydrates (chiefly starch)	18·4
Protein ...	2·2	Ash	1·0
Fat ...	0·1		

On account of the large proportion of carbohydrates, potatoes may be classed as carbohydrates, or starchy food.

Potatoes as a food yield energy, but play a small part only in building up tissue on account of the small protein content. One object in potato selection should be with a view to increasing this protein content.

Potatoes may be grown in most soils, but light soils containing plenty of potash are much to be preferred; the loose soil allows the tubers to expand properly.

A well-drained sandy loam well supplied with humus is an ideal potato soil. The heavier clay lands are not nearly so suitable. They hold the moisture too well and may induce rot; also the potato is often contracted and out of shape. Tubers may also be successfully grown under fresh green sod, but are apt to be flat. The land at all times must be worked deeply before planting and be in good mechanical condition, and in after cultivation sufficient moisture must be maintained near the surface. In the after cultivation there should be a fair depth with cultivator at first, and very shallow as the stalks approach maturity. Avoid cutting surface roots. In very wet land and where there is a heavy rainfall it is better to hill the plants; this helps to drain the land. In drier soils and with poorer rainfall flat cultivation is the best, but much after cultivation between the drills must be indulged in to destroy weeds and conserve moisture.

Potatoes should not be planted in the same soil two years in succession, and are more profitably grown in a rotation of crops. This allows the land to recover, and also tends to destroy any diseases left in the soil. They are a capital preparation for a wheat crop, saving much labour in getting ready

for the latter by leaving the soil in fine tilth; when it is intended to hill, plant potatoes about 4 inches, and when for flat cultivation, 6 inches deep—a double mould-board plough is a good implement for hilling potatoes.

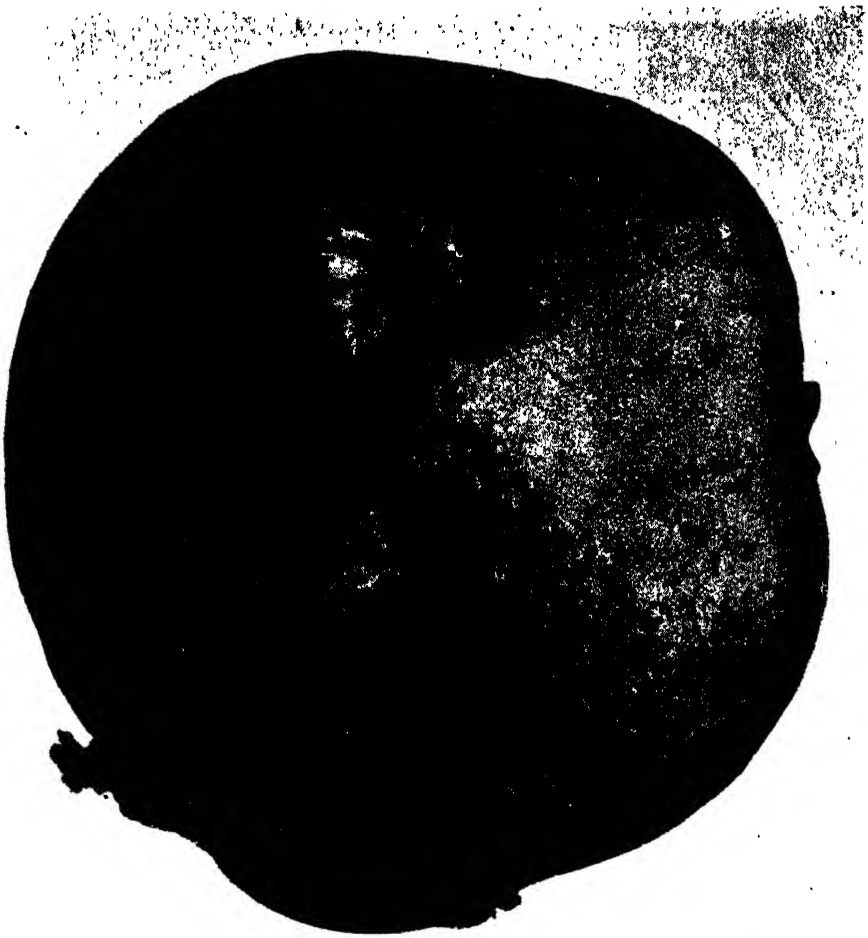
Manuring.—Potatoes require abundance of potash—sulphate of potash is a very good form in which to apply it—but this manure acts better when in combination, especially with superphosphate, say, in proportion two of the latter to one of sulphate of potash; they also require nitrogen, but this may be supplied when required by ploughing in legumes such as clover, peas, beans, &c. Too much nitrogen is not good, as haulms may grow too strong at the expense of tubers.

Irish Flounder. Natural size.

Well-rotted manure is splendid for potatoes, and may also be used in combination with artificial manures. Wood ashes are also good, as they are rich in potash. "Thomas' phosphate" or basic slag—a by-product from the manufacture of steel, is also a useful manure; this should be supplied before planting as it is slow-acting.

Easily soluble manures may be applied either above or below the sets, but should not be allowed to touch the seed, more especially if cut sets are used. Manuring may be very successful when done in broadcast fashion, and well mixed with the soil before planting.

Seed.—Tubers intended for seed should be selected from healthy, vigorous plants with good foliage,—these could be marked with a stake early,—then, when digging, select the tubers growing under the most prolific plants, having due regard to their size and trueness to the type they represent. Small potatoes growing with large ones under a prolific stalk may produce a good crop, but in no case plant small potatoes when this is not known, and



Centennial. Natural size.

they are better in every case discarded. Large, well-formed tubers in every case are the best, and generally whole sets are more prolific than cut sets. However, opinions differ somewhat, but the weight of sets is very important as it is the plant food that gives the young plant its start in life; a small, miserable set cannot have a good supply to nourish its offspring till it can gather food for itself. A good potato should be true to type, clean skin—

that is, free from disease; the eyes should not be too deep, but large and well defined for all that, especially for seed. Large eyes bear large shoots. All staggy sorts, and with excrescences of all kinds, are not good when mature. The tubers when cut and then put together should adhere closely, showing a large percentage of starch. When ripe the skin is firm and not easily rubbed off.

Planting.—The set—that is, tuber or portion of tuber planted—should in no case be less than 2 oz. in weight, with at least two eyes. The weight is of much consequence, more so than the number of eyes, providing there are at least two. If cut before planting, rub off long and weakly shoots. Potatoes sprouted in sunlight produce vigorous plants, and may be sown just as they are, the shoots to be placed in an upright direction—the very best crops have

Northern Star. Natural size.

been produced in this way, and they mature earlier; but tubers sprouted in the dark often produce long and weakly shoots, and if planted, these must be rubbed off. Where the potatoes are cut, in order to prevent much bleeding, ashes, slacked lime, or soot may be used. Whole potatoes of good size are recommended when procurable; cut potatoes are more liable to rot in dry soil. Cut tubers lengthwise when convenient. The drills or furrows where sets are to be planted should be from 2 feet 9 inches to 3 feet apart, and the sets placed in them from 12 inches to 15 inches. A good plan is to run a harrow over the soil just before they should appear above the ground, to destroy young growths of weeds.

Digging the Crop.—Dig early potatoes when of a marketable size; but for keeping over the winter the haulms should be quite dead, tuber firm, and the skin hard to rub off. For this, the main crop, do not sow too early in the season, or there may be much difficulty through their shooting. Only plant good keepers in this connection.

Ashleaf Kidney. Natural size.

Potatoes to be kept through the winter should be placed in a cool, dry shed, on straw if possible, or in dry sand under cover, or they may be stored in the open in pits, say heaped up about 4 feet deep, about 4 feet wide, and 8 feet long, a 6-inch layer of straw spread over the lot and covered up with earth so that water will not enter—later, if wished, and where frosts are severe, another layer of straw and earth may be put on.

Potatoes are used in some countries for the production of starch, which is abundant in their constitution.

Food for Stock.—In this connection, except for feeding pigs, they have been little used, but the drought and a dull market have brought the unmarketable ones to the fore, and ere long they are likely to be much used in conjunction with other foods, as they are not a complete ration. For pigs they are better when about half cooked than fed raw; for cattle and sheep probably they will answer the purpose as well raw, but should be sliced or bruised to prevent

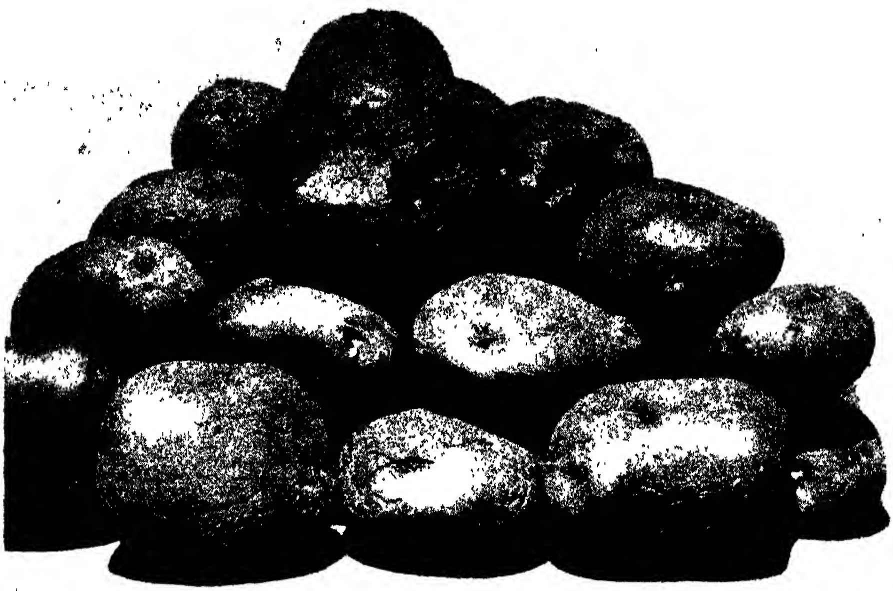
them choking animals when the latter are hungry and tubers whole. The feeding value of potatoes is said to be about equal to beets and turnips ; but the cost of growing them is greater—still, when they are cheap and a large

British Queen. Natural size.

surplus on hand, it is well to know that the inferior tubers may be used with such good effect.

Potatoes grown on top of the soil and matured under straw only.—Some soil is too heavy and stiff for potatoes, and will not allow the tubers to expand. There is much of this class of soil on the flats of New England.

Growing them in straw was tried and the experiment is being continued The ground is ploughed deeply and harrowed into a good state of tilth the potatoes are then placed by hand firmly in the soil until they are abou half covered ; then 12 to 15 inches of wheaten straw is placed over them ; thi completes the planting. Nothing more is done until the potatoes ar picked—not dug—from under the straw, for they lie on top of the grounc around the seed set. Some people do not understand that the potato tube is not the root of the plant, but a modified portion or a runner from th stem. The potato tubers must form above the seed planted, therefore if i is placed on top of the soil they have no option but to grow as they do. Th



Potatoes grown under straw. One-third natural size.

straw forms a protection from the sun and other destructive agents, th same as the earth does when they are grown in the ordinary way. Th potatoes grown last year under straw were only a fair crop, but of beautifu shape, with lovely skins Some were found in the straw hanging to the sten 6 inches off the ground ; most of them were lying on the soil, and some wer slightly buried. They can be looked at at any time during growth by removin the straw, which must afterwards be replaced. The same plant has been looke at several times apparently without damaging the tubers. Will this metho of growing potatoes pay ? This cannot be answered at present, but furthe information is being obtained.

Experiments in growing potatoes under straw and under earth are now being carried on side by side, with the same variety and other conditions being equal; both are now forming tubers nicely. Last year crickets destroyed a good many under straw. The straw, of course, is an item, also carting and laying it on, although the latter operation can be performed quickly, but there is no after-cultivation, and no weeds grow—no digging, straw can be forked away quickly. If successful it will be a handy way for a kitchen garden, as the cook will merely have to go out, put aside the straw, and pick the best tubers off for the pot; those left will probably grow all the better. I do not claim to have made a discovery, but had read somewhere of it being done in Ireland years ago with success, but had to find out the way to do it, as no available data were to hand. The object was to overcome a difficulty in treating the heavy soils which contain the plant food necessary, but are otherwise unsuitable, and the Agricultural Department aims at overcoming these difficulties, and only by experimenting can this be done.

Potatoes grown under straw. One-third natural size.

Potato Diseases.

Scab (*Oöspora scabies*) is a common disease in tubers, and first appears as slight swellings on skin, which increase till they burst; then decomposition sets in, leaving ugly pits or abrasions of greater or less depth. Stable manure, especially if not well rotted, favours the increase of scab; rotation of crops tends to check it.

Perhaps the best treatment yet used, and the simplest, is: 1 oz. commercial formalin (liquid) to 2 gallons of water, soak for two hours in the solution, then cut and plant in the usual manner. Or, 1½ oz. commercial formalin (liquid) to 2 gallons water, and soaked for one and a half hour only, may be used.

Another treatment: 1 oz. of corrosive sublimate dissolved in 12 gallons water. Immerse potatoes for about two hours in this solution.

Variety Trials.

Variety.	Yield, rate per acre. tons	cwt.	qrs.	lb.	Remarks on each variety of Potato.
Red Russet	5	3	3	2	Reliable cropper; good eating sort; splendid keeper and marketable variety.
Irish Flounder	8	0	3	3	Fine cropper; main crop of good quality; does well here.
Centennial	5	14	2	6	Roundish potato; handsome; skin slightly rough; main cropper; excellent for table; does well here.
Northern Star	3	9	0	5	Late potato; good eating; uniform in shape; a fair yielder here.
Early Rose	4	8	1	8	A well-known good eating and cropping variety; one of the best known in the State.
Cambridge Kidney	8	3	1	21	A very large cropper; mid-season variety; handsome tubers with white flesh.
Burbanks (1)	4	17	1	16	Mid-season variety; good cropper; fine quality; handsome, uniform; good for market gardener.
Ashleaf Kidney	6	0	3	4	Early kidney variety; long light skin; yellow flesh of excellent flavour; good cropper.
Aroowstook Cty. Prize	4	19	0	0	A fine potato; appears to be of kidney type; nice shape; good quality.
Brownell's Beauty	4	14	2	16	One of the best known main croppers; capital eating and keep variety; great favourite everywhere.
Early Vermont	0	11	1	15	Good quality; early variety; seed very poor; did not do well this year.
Beauty of Hebron	1	4	0	0	Cropped not too well; tuber of fine appearance.
Bliss's Triumph	0	7	3	12	A potato with a good name generally, but has never done well here; seed obtained was very inferior.
Selected Early Rose	2	5	0	5	A special strain of Early Rose sent here did fairly; a very nice potato in appearance, like original variety.
Manhattan	3	5	1	21	A good market variety; long season sort; improves with age; dark blue skin; a splendid keeper.
Herd Laddie	0	19	2	16	Very small tubers; did not do well this year.
King Edward	1	5	3	20	A very pretty potato, splashed with purple; not a good yielder here; quality not tested.
Adirondack	3	9	1	10	Good looking tuber; good eating; main cropper.
Carmen No. 1	1	6	0	14	Good shape; good eating; did only fairly; worth further trial.
English Pink	4	4	1	24	Good keeper and cropper; good eating, and handsome potato; suitable main crop.
Eureka	1	2	2	1	Did only fairly well; not a good appearance.
American Freeman	0	5	3	16	Very small tubers; did very poorly here this year.
Early Puritan	4	1	2	2	A mid-season variety; a good eating sort; nice white flesh.
Sutton's Ideal	0	13	3	0	Pretty tuber; did not do well here this year.
Evergood	4	4	1	24	Good quality; reliable cropper; good shape; main cropper.
Parsons' Seedling	6	7	0	10	A heavy cropper, but very coarse.
Lord Tennyson	1	7	2	0	Handsome appearance; mid-season variety; keeps well.
Early Rose (imp.)	4	3	3	14	Very nice potato; good cropper, and very similar to ordinary Early Rose variety.
Sir John Llewellyn	0	2	1	23	Small, and did not do well this year.
Windsor Castle	0	7	1	13	Did not do well; tuber very small; seed obtained very poor.
British Queen	6	12	3	26	Good cropper; fine quality; standard variety; for main crop; fine appearance; white skin.
Ringleader	0	14	1	10	Small poor crop this year.

VARIETY TRIALS—*continued.*

Variety.	Yield, rate per acre. tons	cwt.	qrs.	lb.	Remarks on each variety of Potato.
Carmen No. 3	4	4	1	24	Good cropper; uniform in shape; good appearance; mid-season variety.
Ninety-fold	0	13	0	18	Nice looking; very poor yield this year.
Sir Walter Raleigh	6	10	2	14	Good cropper; good all round sort; main cropper; keeps well; fine appearance.
Uncle Sam	1	7	2	0	Only cropped fairly this year; worth another trial.
State of Maine	6	1	3	4	A good eating variety, and suitable for main crop.
Boree	2	18	3	20	A mid-season variety; good, useful potato; could be used for main crop.
Green Mountain	1	16	2	26	A handsome potato and good quality.
Early Thoroughbred	6	4	2	26	Mid-season variety; handsome and of uniform shape throughout; good table sort; eyes near surface.
Centennary	1	8	0	10	A fair sized tuber and good keeper.
Early Ohio	2	15	0	22	Nice tubers; appears to keep well.
Coronation	5	15	3	16	A good cropper, of fine appearance; good all round sort; dark skin; eyes very near surface.
Delaware	0	1	0	0	Very small tubers and poor yield.
Anderson's Country Boy	5	18	1	22	Good eating variety, and keeps well; should be good for main crop; eyes rather deep.
Anderson's Satisfaction	8	18	3	0	Good cropper; suitable main crop; good keeper; rather round; appears to be same as Centennial.
Anderson's Royalty	13	16	0	24	Very big cropper, of the Kidney variety in appearance; long, rather coarse to look at; quality not tested.
Up to Date	2	4	0	22	A very good variety for a main crop; pale skin.
Burbank's No. 2	6	6	2	22	Mid-season variety; good cropper; tubers of even size; fine appearance.
Ideal	0	9	3	8	Good looking tuber; fine skin.
Early Fortune	1	6	0	14	Did only fairly; worth another trial.
New White Peach Blow	0	12	2	24	Fairly early; good looking; a pretty tuber for show.
Crine's Lightning	0	2	3	22	Did very poorly here; seed obtained small and shrivelled.
Rural New Yorker	2	1	2	16	Fair cropper; good looking tuber.
Maori Chief	2	3	0	24	A tuber of very good appearance; fine quality for table; eyes near the surface; main cropper
Sutton's Satisfaction	1	13	1	16	Longer than Anderson's Satisfaction, and quite unlike it; lighter in colour.
May Queen	...	....			Tubers did not sprout; poor shrivelled seed planted.
Thorburn	....				Do do do

The above fifty-eight varieties were grown side by side under same conditions, with the exception of Brownell's Beauty and Manhattan, neither of which had such a good chance; they are not comparable with the others, or with themselves. The seed of the following varieties was poor and shrivelled, and only planted to preserve the strain, the seed had been disbudded several times; they are as follows:—Early Vermont, Bliss's Triumph, Herd Laddie, American Freeman, Eureka, Sutton's Ideal, Lord Tennyson, Sir John Llewellyn, Windsor Castle, Ringleader, Ninetyfold, Uncle Sam, Green Mountain, Centennary, Delaware, Early Fortune, Ideal, New White Peach Blow, Crine's Lightning, Sutton's Satisfaction.

The former treatment, viz., with formalin, is recommended, and has been used on this farm

Downy Mildew, or *Rot*, attacks stems, leaves, and tubers. Treatment: Weak solutions of Bordeaux mixture sprayed on at short intervals often effects a cure.

There are other diseases which require special treatment; but it is always best, when a badly-diseased plant appears, to pull it up and burn it.

I am indebted to Mr. A. A. Dunnicliff, of the Department of Agriculture, for valuable information *re* the varieties, which he found all true to name, except, he points out, that one that was sent here under the name of "Satisfaction" is "Centennial," and it now goes under that name here; it is one of our very best.

A preliminary experiment was made to find out best seed to plant, as follows:—

A potato 6 oz. in weight, with sixteen eyes: The yield from one plant was 8 lb. 12 oz., the largest tuber weighing 13 oz., and smallest, ¼ oz.; a very uneven lot.

A potato ½ oz. only in weight: The yield from one plant was 3 lb. 4 oz.; largest tuber, 8¼ oz.; smallest tuber, ½ oz.; an uneven lot.

A potato 2 oz. in weight, with five eyes, yielded 4¼ lb. from one plant; largest potato being 8 oz., and smallest tuber, ¼ oz.; a very even lot generally.

All the above were planted whole, none being cut.

Further and more extensive experiments relative to the above, and also to cut and uncut seed, are in course of being carried out at the Farm here this year.

Notes on Humus and the Best Means of supplying it.

F. B. GUTHRIE.

OVER that considerable portion of the State's arable land on which the rainfall is limited or uneven, the need of retaining within the soil whatever moisture is received as rain is one of paramount importance in the treatment of the land. The maintenance of the soil's fertility in these areas becomes largely a question of conserving this sometimes scanty supply, and soil treatment having for its object suitable means of maintaining the most favourable conditions as to moisture will claim the most serious consideration of the farmer.

As the land taken into cultivation gradually extends so as to include more and more of the area within the belt of reduced rainfall and approaching to semi-arid conditions, this question of the conservation of soil moisture becomes of increasing importance.

It far exceeds in importance the question of manuring, and it is safe to say that unless the conditions as to moisture are satisfactory the application of manures is not likely to be of any benefit, and the money expended on their use is practically thrown away.

Apart from the question of cultivation and drainage, the maintenance of the best conditions as to water within the soil depends to a very large extent upon the presence of humus. Humus, which is derived from the gradual decay of animal or vegetable matter within the soil, is one of the most important of the soil's constituents, and any variation in its amount affects profoundly the value of the soil for agricultural purposes.

Functions of Humus.

The presence of humus in the soil increases the fertility in the following ways:—

In the first place it absorbs and retains moisture in the soil, and prevents surface evaporation. A surface soil, fairly rich in humus, exercises much the same influence on the underlying soil as does a mulch of dead leaves or other vegetable matter. During dry spells, and under the influence of the hot winds usually prevalent under such conditions, the loss of moisture from the soil by surface evaporation is enormous, and in soils destitute of humus this loss is so rapid as to result in the drying up of the soil and the wilting of the crops. The final result of such conditions is the formation of scalded spots and the complete removal of the fine surface soil in the form of dust.

The humus in the soil is the ingredient which is most subject to alteration and destruction, and under dry conditions it is more or less rapidly destroyed. As soon as it has lost its moisture and become dry it is rapidly burnt out by the combined action of sun and air. So that it is exactly in those circumstances where its presence is most essential that it is most liable to destruction, and the necessity for renewing it most urgent.

The presence of humus in the soil also tends to improve the texture of the soil, lightening it and loosening it, and preventing compaction of the surface, so that it is of special value in the amelioration of stiff soils.

It is the principal source of nitrogen in the soil, and by its decay under the influence of soil organisms, ammonium salts and nitrates are produced, which are the forms in which this important element is assimilated by the plant. It is of interest to remember that the humus of arid or semi-arid regions is richer in nitrogen than that of the moister districts. This is a point of great importance with reference to the potential fertility of these soils. In point of fact from a variety of causes acting together, the soils of the dry climates are richer in plant food of all kinds than are the soils in regions of greater rainfall, consequently nothing but the absence of water prevents these from being extremely reproductive. There is, therefore, no problem which exceeds in importance that of retaining in the soil the little moisture that it receives, and any operation that succeeds in arresting even partially the unavoidable loss of that moisture deserves the highest consideration.

Methods of supplying Humus.

There are three ways of supplying humus to soils in need of this constituent, namely by the application of generous additions of farmyard manure (in cases where this is available), by the application of compost manure, and by green-manuring, or the ploughing under of a quickly growing green-crop (leguminous for choice). We will discuss these separately.

Farmyard Manure.

Except in some dairies or such farms on which the animals are stall-fed, the material known as farmyard manure is nothing more than the solid excrements of animals, and does not contain either the urine or the vegetable matter used as bedding which is the characteristic of farmyard manure made and used in Europe and colder countries.

Owing to the absence of vegetable matter such manure has very little value in the formation of humus, and it is probably most economically used in the compost heap.

The Compost Heap.

The compost heap is a most valuable adjunct to the farm, and it is a very great pity that it is not more frequently to be found.

A heap or pit can be made very economically, and is of special value in that it utilizes all sorts of vegetable and animal refuse, which would otherwise be wasted, and converts it into a valuable manure, rich in vegetable matter and eminently suited for soils low in humus or subject to droughty conditions.

The principle of the compost heap is the fermentation of easily decomposed vegetable material in the presence of earth and lime. It is not only substances like peat and straw, which form the usual basis of compost heaps that are thus decomposable, but almost every kind of organic substance, both of vegetable and animal origin, can be thus composted. Dead leaves, bush scrapings, sawdust, weeds, tops and stalks of vegetables, as well as bone and animal refuse, can be treated in this manner. In the case of animal refuse the operation is much slower, and substances like bones should be first crushed. It is also important to be sure that animal refuse so treated is not derived from a diseased source.

The best way of making and maintaining the compost heap will depend largely upon local surroundings.

As a general method of procedure the following will be found satisfactory:—Make a heap with alternate layers of earth, refuse, and lime. Under the term refuse is included all the refuse material of animal or vegetable material mentioned above. Cover the whole with a layer of earth. When a sufficient quantity of refuse is again collected, place it on top of the heap and cover with a layer of lime, and lastly of earth, until the heap is 3 to 4 feet high. The heap should be kept moist, and for this purpose all refuse water from the house, slops, urine, &c., should be added. The heap may be conveniently watered by making a hole into the interior and pouring the liquid in. The covering with earth has the object of absorbing any ammonia which is evolved in the process of fermentation and by the action of the lime.

When the heap has been prepared it must be left to itself to ferment for a greater or less time. Probably a few months will be sufficient unless very refractory substances, such as bone, &c., are present. In a few months' time it should be well forked over and another layer of lime and finally of earth should be added. In the course of another month or two it should be ready for use, and you will have provided yourself at a very slight cost with an excellent manure rich in humus, and will have utilized for the purpose a great amount of refuse material which would otherwise be lost or burnt. When refuse material is burnt, the ashes, though still possessing manurial value on account of the lime and potash and phosphates they contain, are of incomparably less value than the original substances out of which they are derived, owing to the absence of humus material and of nitrogen, which have been lost in the process of burning.

Instead of a heap the compost may be conveniently prepared in a pit. In either case the bottom should be cemented, or so drained that the liquid escaping from the mass can be collected and returned to the compost.

It will be found advantageous to prepare a second heap while the first one is ripening and being used. It will also be found that if it is desired to use more concentrated fertilizers, such as superphosphate, potash, and ammonium salts, these can be mixed with advantage with the compost

manure, before being applied to the land. Used in this way they will be in less danger of leaching away, and will be of greater benefit than if applied directly to the land.

Green Manuring.

Amongst the most effective methods of supplying humus to the soil and increasing its fertility is the practice of green-manuring—that is, the ploughing under of a green crop. The beneficial action of this operation is a twofold one: it enriches the soil, in the first place, by supplying it with a considerable proportion of readily-available plant-food; and in the second place, by adding humus, and thus improving the soil's texture and its power of absorbing and retaining moisture. When such a crop is buried, the surface soil becomes enriched by the nourishing materials which the crop during the period of its growth has drawn from the air and from the lower portions of the subsoil, and this material is now placed within the reach of the succeeding crop.

During the growth of the plant the soil has, in addition, been stirred up and disintegrated by the development of the roots. When ploughed under, provided that sufficient moisture and warmth are present, the buried mass decomposes with more or less rapidity, and the succeeding crop gets the benefit of the fertilising ingredients contained in the decaying mass of vegetation in a readily-available form. The resulting humus is of the greatest value, not only as a source of plant-food, but in improving the soil's texture, in preventing too rapid evaporation, and in enabling the soil to absorb and retain water, thus rendering it less liable to suffer during dry spells.

A further important result is the formation of carbonic acid by the decomposition of the buried crop. Carbonic acid is given off abundantly in the fermentation of the mass, and assists in the disintegration of the soil and in rendering available the plant-food contained in it.

Green-manuring is effective both in sandy and on heavy clay soils, and, indeed, on all soils deficient in humus. On sandy soils the effect of green-manuring is to consolidate the soil, the humus formed binding the particles together. On clay soils, the effect of the addition of humus and the production of carbonic acid is to loosen and aerate them. When conditions as to warmth and moisture are favourable, and the crop decomposes fairly rapidly, the production of soluble plant-food proceeds with considerable rapidity. This is especially the case in respect of nitrogen, which is the principal manurial ingredient. Nitrification (that is, the conversion of the nitrogenous material of the plant into soluble nitrates) takes place quite rapidly. In sandy soils, green manure nitrifies more rapidly than manures like dried blood, bone-dust, &c., and only less slowly than ammonium sulphate; while in stiff clay soils the green crop nitrifies very much more rapidly than either sulphate of ammonia or animal manures.

With regard to the kind of crop to be used for the purpose of green-manuring, a good deal of latitude is permissible. Any crop that is rapid and luxuriant in growth, and that can be readily turned under, is suitable for the

purpose, and the selection will be guided by considerations such as the time of year at which it is to be grown, its suitability to soil and district, &c. Amongst the most effective class of crops for the purpose are leguminous plants, such as clover, cowpea, lupines, &c., since these are specially valuable on account of their power of obtaining their nitrogen from the air. They are, therefore, especially suitable for soils poor in nitrogen, and are of high value in enriching the soil with this ingredient. There are, however, many other crops which are suitable for the purpose, and frequently used, such as mustard, buckwheat, &c. These are all rapid growers, and can be grown as catch-crops—that is to say, after the main crop has been harvested and before the succeeding one is sown. The practice of growing a crop of tares or vetches after the wheat crop has been harvested is very common in Europe, and can be followed successfully here in districts where the autumn rainfall is sufficient. Such a catch crop occupies the ground only at a time when it would be otherwise unoccupied, and, during its growth is collecting plant-food from air and soil, which is utilised for manuring the succeeding crop.

The practice of green-manuring is of special value in orchard work, where the green crop can be grown and ploughed under between the rows.

It must be borne in mind, in all cases, that green-manuring depends for its success upon conditions favourable to the decomposition of the buried green crop, namely, sufficient warmth and moisture. A crop ploughed under in the late autumn or winter will nitrify only slightly, and the same applies to ploughing under a crop in a dry season. If the land is quite dry the crop will remain buried without decomposition for a considerable period, and its benefit is lost.

Proportion of Nitrogen supplied to Soil by Green Manuring

With regard to the actual amount of material supplied to the land by ploughing under a green crop, some experiments were carried out at the suggestion of Mr. Allen, the Fruit Expert of the Department.

The produce of one square yard of crops of vetches, at Wagga, Bathurst, and Hawkesbury College, was harvested carefully, tops and roots, and forwarded for analysis. In the case of the Wagga sample, the roots were obtained by washing away the soil, and Mr. McKeown calculates that he succeeded in obtaining 95 per cent. of the total weight of roots in the soil. The produce of tops from one square yard was 4 lb. 14½ oz., or 10 tons 12 cwt. per acre; and of roots, 1 lb. 9 oz. per square yard, or 3 tons 7 cwt. per acre. Analysis showed that the tops contained 87 per cent. water (13 per cent. dry matter), and ·506 per cent. nitrogen; the roots contained 83 per cent. water (17 per cent. dry matter), and ·213 per cent. nitrogen.

When therefore, this crop is ploughed under, it will add to each acre of the soil, in the shape of dry matter, 1 ton 7 cwt. tops, and 11½ cwt. roots, including 120 lb. nitrogen from the tops and 16 lb. nitrogen from the roots;

a total of 136 lb. nitrogen per acre. Assuming that conditions are favourable for nitrification, this will be equivalent to a dressing of nearly 7 cwt. sulphate of ammonia per acre, or over 11 cwt. dried blood—an enormous dressing.

The soil in which this crop was grown was a light loam with about 25 per cent. clay. The clay is of a tenacious character, and has a tendency to cake hard on drying. The soil is low in humus, containing only about 4 per cent. of this ingredient. It is fairly rich in potash and satisfactorily supplied with lime, but rather low in nitrogen and phosphates. It is, consequently, just the type of soil in which green-manuring should be effective, as the effect of ploughing under the crop will be to break it up and render it more friable, and to supply the deficiences in humus and nitrogen. Its efficacy is, of course, dependent upon conditions as to rainfall being favourable to its decomposition in the soil. The climate of Wagga is not very favourable to the growth of these crops.

At Bathurst, and at the Hawkesbury College, where conditions are more favourable, the benefits of green-manuring are even more striking. Mr. Allen obtained similar samples of tops and roots, representing the produce of one square yard from crops grown at these places, and they gave the following figures:—

At Bathurst, the tops weighed 17 lb. and the roots 2 lb. 5 oz. per square yard, or 36 tons 14 cwt. tops and 5 tons of roots per acre, giving a total of dry matter to be ploughed under of 4 tons 15 cwt. from the tops and 16 cwt. from the roots. Assuming the same nitrogen content in tops and roots as was found in the Wagga plants, this will give when ploughed under 411 lb. nitrogen per acre from the tops and 22 lb. nitrogen from the roots.

At Hawkesbury, the produce was 21 tons 12 cwt. tops and 4 tons 14 cwt. roots per acre. When ploughed under, this would yield 2 tons 16 cwt. dry matter from the tops and 16 cwt. dry matter from the roots. With ·5 per cent. nitrogen in the tops and ·2 per cent. in the roots, the soil will be enriched in nitrogen by 242 lb. per acre from the tops and 22 lb. from the roots.

Knots.

F. G. CHOMLEY.

EVERY farmer uses ropes for some purpose, either for tying on loads or in connection with his stock, but it is seldom that one sees the most suitable

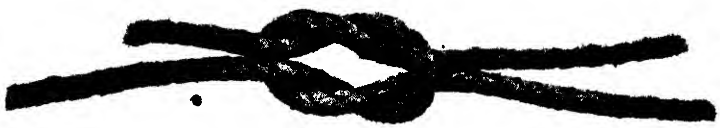


Fig. 1.—Reef knot.

knots employed. A good knot should be easy to undo—that is, it should not jamb when a strain is put on it, nor should it become fast when wet. There

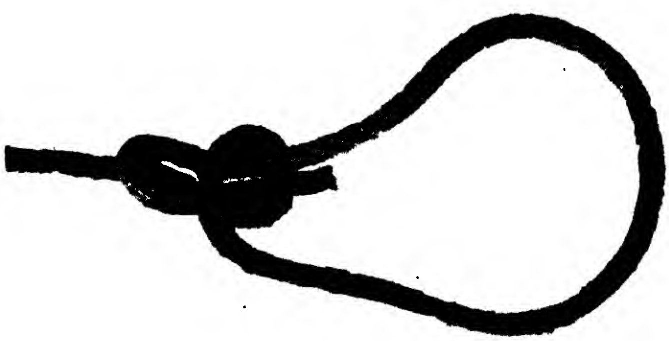


Fig. 2.- Bowline.

are so many knots employed by sailors, that to refer to a work on knots and cordage is almost bewildering, and many of the knots shown in such works

are purely of a fancy nature. For the purpose of simplifying the matter, a few of the more useful and easily-tied knots are here shown. These are all

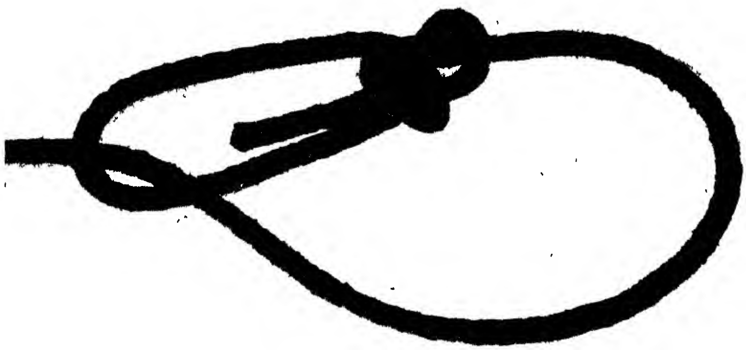


Fig. 3.—Running bowline.

easily tied, and were tied and photographed specially with the view of showing clearly how it is done. For this reason they are not pulled up tight, but were just tied loosely, so as to show as clearly as possible how the ropes "lay" over one another

Fig. 4.—Becket, or sheet bend.

There are two knots that stand out as useful knots above all others, and these are the "reef" or "square" knot and the "bowline." The reef knot

(Fig. 1) is the best knot for most purposes; where it is necessary to join two ropes, it will not jamb except when the rope is very thin.

The bowline (Fig. 2) is a very useful knot indeed, and is quite safe; it cannot possibly slip, and for this reason is a suitable knot to use for tethering

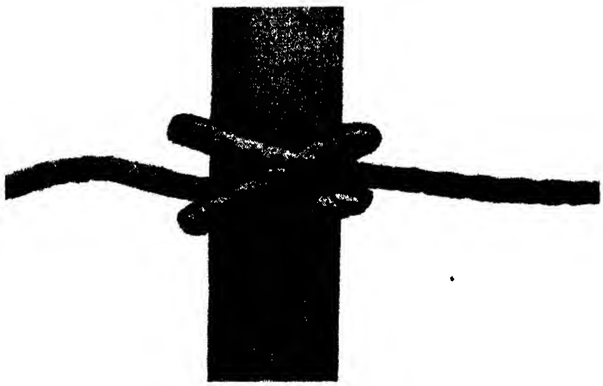


Fig. 5.—Clove hitch.

stock. If a running loop is required, the running bowline (Fig. 3) is a good form, as the loop will not pinch on the rope and give trouble when in use.

The plain, becket, or sheet bend (Fig. 4), is another useful knot for joining two ropes—especially when one end runs up to, and stops at, a pulley-block, there is no loose end to feed into the block and jamb it.

Fig. 6.—Timber hitch.

The clove hitch (Fig. 5) is also a useful knot for use with poles and guys. It will not slip in either direction, and is easily undone.

It sometimes happens that there is some building or well-sinking going on on the farm, so it is just as well to know how to make a timber hitch—this is shown in Fig. 6. This knot can be combined with a half-hitch by passing the fall of the rope round the spar, say, 2 feet along its length and back under itself. This makes a good hitch for lowering timber down a shaft or well. This is shown in Fig. 7. It can be made additionally safe by putting in another half-hitch another 2 feet along the spar.

Sometimes it is desirable to reduce the length of a rope without undoing the ends; when loading, for instance, the ropes may be reduced in length by

means of the sheep-shank previous to putting in twitches. There are many times when it is handy, and it is very simply tied. It is shown in Fig. 8, but it is far easier to tie than it looks.

For tightening ropes over loads of hay, straw, lucerne, green stuff, and other springy loading, no means is so rapid as the one shown in Fig. 9. The fall is taken through a ring or round the guard-irons of the dray or waggon. A loop in the bight is grasped in the hand, and a half-hitch is made round the end of the loop higher up the bight; the end of the fall is then passed through the loop thus made, and used as a pulley block or snatch block. It is a little bit rough on the rope pulling it through the loop, but it enables the rope to be drawn very tight and thus keep the load quite firm. It is possible to extend this system by putting more than one such loop in—a second, or even a third, can be put in

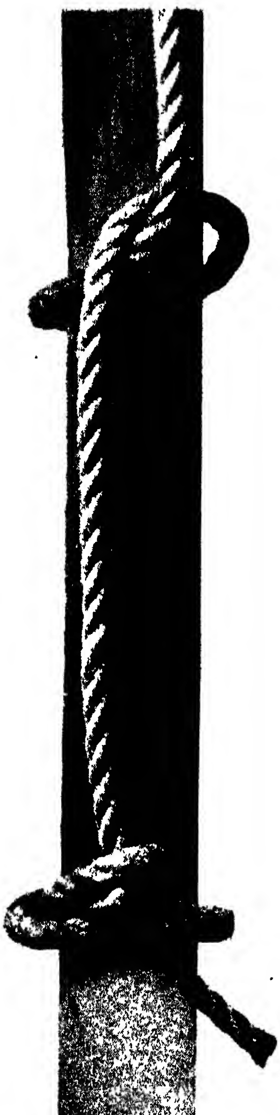


Fig. 7.—Timber hitch with half-hitch.

Fig. 8.—Sheep shank.

the fall in succession. But for all ordinary purposes one is enough. If the load is going any distance, the twitch method, using sticks, is better.

The too common knot generally called the granny is shown in Fig. 10. This knot is easier to tie, and far harder to undo than a reef or square knot, yet it is the usual knot tied by the inexperienced. To SOME people the granny knot comes natural—the knot is liable to slip ; it is frequently used by shop assistants to tie parcels, probably with the object of increasing sales. The best way to untie a granny knot is to—cut the rope. Of course, there are many very useful knots not shown, but because they are not shown is not to say they are useless, or merely fancy knots, for such is not the case; but those shown may be considered a few of the most useful, simple knots in general use.

Fig. 9.

Fig. 10.—Granny knot.

The Influence of Bees on Crops.

[Continued from page 879, November, 1907.]

ALBERT GALE.

In "The Story of the Plants," Grant Allen says, "The use of the corolla with its brilliant petals, is to attract insects to the flowers and induce them to carry pollen from plant to plant. That is why they are painted red and blue and yellow ; they are there as advertisements to tell the bee or butterfly "Here you can get good honey"! If the brilliant coloured petal of flowers are so attractive to bees, how is it the single blooms are more attractive to them than double ones of the same variety and species having the same colour ? Here is the answer : The single ones produce pollen which is the all-essential food supply for the young bees, but truly double blooms produce no anthers, therefore they produce no pollen. Where bees can get the greatest supply of food in the shortest space of time is the place where they will go. They do not care what colour the corolla is, it may be "painted red, blue, or yellow," the pollen and honey are the advertisements. Neither do they care what colour the pollen is because they carry home white, yellow, and red pollen indiscriminately, but only one colour at the same time. The cells in the combs that are packed with pollen contain any colour they can get. Food is the advertisement, and not the colour in the corolla or the petals.

In some of our most ornamental plants the flowers are so inconspicuous were it not for their foliage they would be treated as weeds and rooted out. The brilliant foliage is their only recommendation. The carpet beds in our Botanical Gardens during summer are one of the chief attractions to the grounds. They are nothing but leaves. There is no denying their brilliancy. Watch as long as your patience will permit, you will never see pollen or honey-feeding insects alight on them for the purpose of obtaining food. If the clipping or trimming of these carpet beds be neglected, and the tiny flowers be permitted to expand, you will at once see bees and other insects alighting for grains of pollen and sips of honey.

The caladium and the coleus have foliage far more showy than the blooms of scores of plants that are constantly visited by bees, but bright as the foliage may be, the bees are not attracted thereby. When the coleus throws up its spike of pale blue flowers then it becomes attractive to insects, and they are drawn to it, not by the colour of the flower or the leaf, but by the food contained in the former.

In the month of September the peach-trees are in full bloom, so are the bougainvilleas. The brilliant crimson bracts of the latter, with their small

creamy-white flowers, are equally as attractive in colour as the peach-trees, yet where one bee visits the latter a thousand will visit the former.

The manufacturing of artificial flowers has become so perfect of late, and the imitations are so much like natural flowers that when placed amongst natural foliage, the experienced eye of the florist frequently fails to detect the fraud. Even if it be a honey or pollen bearing imitation *bees* are not deceived thereby. If the colour of the flowers or their forms are the advertisements telling them where they could get honey, how is it that bees and other insects are not swarming on the head-dresses of the fashionably attired ladies of to-day? No one can deny that these artificial flowers are as perfect both in form and colour to the sight as the natural ones they are meant to represent, only their essentials of reproduction are absent. The food bees require is wanting, and food, and food alone, is the only advertisement that will induce the bee to search for sustenance even in natural blooms. Their natural intelligence and generations of education have taught them the true sources of wealth. Bees will no more search colours in the expectation of getting food than a gold-miner would go fossicking in a coal-pit for gold.

Botanists and entomologists speak of bees as one of the highest types of insects, and Grant Allen, in "The Story of the Plant," speaks of them thus:—"These higher insects . . . are the safest fertilisers because they have legs and a proboscis exactly adapted to the work they are meant for; and they have also, as a rule, a taste for red, blue, and purple flowers, rather than for simple white or yellow ones. Hence, the blossoms that especially lay themselves out for the higher insects are almost always blue or purple."

Darwin, in "Self-fertilisation of Plants," says:—"Not only do the bright colours of flowers serve to attract insects, but dark-coloured streaks and marks are often present, which Sprengel long ago maintained serve as guides to the nectary," and "that the coloured corolla is the chief guide cannot be doubted." The native daphne (*Pittosporum undulatum*) flower has a creamy corolla hidden amongst its deep green foliage. These trees, both in the Botanic and in private gardens, were in bloom at the same time as the double-flowered peach. In the former the bees were in swarms busily at work, and only an odd bee occasionally visited the latter, and the flowers visited were those containing a few scattered anthers from whence they could scrape together a few grains of pollen. The bright blooms of the double-flowering peach could be seen hundreds of yards away, but to discover the flowers on the pittosporum you need stand underneath the tree. There is no flower in this State more frequently visited by bees than the simple white or creamy yellow eucalyptus bloom. It is the bee-keeper's most important source of profit.

Again, we are told that markings on certain flowers are finger-posts. "The lines or spots so often found on the petals of highly-developed flowers," says the author of "The Story of the Plant," "act as honey guides to lead the bee or other fertilising insect direct to the nectary"; he then goes on to describe the "so-called nasturtium." The upper pair (of petals) are broad and

deep-lined with dark veins which all converge about the mouth of the spur, and so show the inquiring insect exactly where to go in search of honey. The lower three on the other hand, have no lines or markings, but possess a curious sort of fence running right across the face, intended to prevent other flying insects from alighting and rifling the flower without fertilising it." The nasturtium is bi-sexual (one of those whose stamens develop before the pistil), which is said to be the reason the nectary is situated so far down the spur. In most bi-sexual flowers, in those where the stamens are first to develop, and also in those where the pistil first comes to maturity, the nectary is *not* situated low down, and as far as we know bees find no difficulty in fertilising them. Such flowers, *i.e.*, those whose nectaries are easily accessible, however, produce plenty of seed. How bees must be baffled when they visit unicolour flowers?

What a waste of time it must be for insects to discover the nectary where Nature has been so remiss as not to put up guide posts. In the wild nasturtium of India the two upper petals have these "guide posts," but the three lower ones have not. The cultivated descendants of these have altered wonderfully in their shades of colours and markings Now before me, I have some blooms that are like the originals, only the three lower petals have markings. The markings on the two upper ones are brick-colour, and in form like the broad-arrow, the apex pointing towards the nectary. The marking on the lower petals are somewhat similar only the apex points out wards. In blooms of such character are bees much perplexed to discover the nectary? I have also before me a nasturtium unicolour, a pale sulphur-yellow, yet when in the garden I saw the bees were never at a loss which way to turn to find the nectary, and this flower was visited as regularly as those of brighter colours, and most pronounced markings. George Massee, in "The Plant World," says "that the only use of colour in the flower is that of an advertisement indicating their presence to insects." When stamens lose their character as such, and become petals, the intensity of colour increases and it becomes more attractive to the eye; nevertheless, the more double a flower becomes the less it is attractive to insects.

Mr R. T. Baker, Curator, Technical Museum, informs me that when botanising in the mountainous districts of New South Wales, near a garden filled with gorgeous-coloured flowers, he observed a specimen of *Panax sambucifolius*, the small, inconspicuous flowers of which were literally swarming with bees in quest of honey and pollen; and those brightly-coloured blooms in the garden were in nearly every case passed over by the bees for the purpose of visiting the specimen named.

Some of the writers I have referred to have given their experience of watching bees searching for the nectary, and the insects' apparent failure to discover it at first sight. When bees are seen searching about the essential organs of flowers it is not the nectary they are in search of, but the gyrations they make are for the purpose of collecting the grains of pollen. If a bee is seen at work on a sunflower or other composite bloom, her movements in gathering pollen differ greatly from those in collecting honey. Every leg is

brought into play in the former work, and her motions are as systematic and various as the figures in a country dance. How differently she goes to work in collecting honey. Her head bends towards every expanded flower, and her tongue is thrust into every nectary. At some she pauses momentarily—some insect has been there before her; at others her stay is longer; she has her reward.

Notwithstanding an insect may have rifled the nectary of its honey, and when visited by the bee found to be empty, in a few minutes another or the same bee will revisit it, and this time her stay may be longer, because between the two visits the nectary will have secreted another supply. The indecision of the bee at a flower is no proof that she is looking for the position of the nectary.

To-day bees may be industriously at work upon a flower of certain colour, and to-morrow forsake it for one of less conspicuous shade. "It would appear," says Darwin, "that either the taste or the odour of the nectary of certain flowers is unattractive to hive bees, or to humble-bees, or to both, for there seems no reason why certain open flowers which secrete nectar are not visited by both. The small quantity of nectar secreted by some of these flowers can hardly be the cause of their neglect, as hive-bees search eagerly for the minute drops on the glands of the leaves of the *Prunus laurocerasus.*"

"The small quantity of honey secreted" is the cause. Within a near radius there were, undoubtedly, flowers that were secreting larger quantities of honey, and both humble and hive-bees always visit flowers where they can gather the greatest quantity in the shortest space of time. When the hive-bees were searching "eagerly for the minute drops on the glands on the leaves of the *Prunus laurocerasus*," the honey flow must have been scarce elsewhere. I have seen bees in time of a honey famine search the most unlikely places in the hope of getting something to take home. "A drowning man will catch at a straw," and a bee on short allowance will search anything and anywhere to keep the cupboard full.

Some years ago, at Cooma, in a dry season, a bed of turnips ran to flower. They were sown on a sandy, thirsty soil. For three or four days they were beseiged by bees. Almost suddenly the bees ceased to visit the turnip blooms, although they were still expanding. The cause of their forsaking the turnips became evident. About one-third of a mile away, on the banks of a creek, a small paddock of lucerne had flowered, and the bees were bestowing their attention on it, because it was yielding a greater supply of food. Their harvest from the lucerne lasted but a day or so. The scythe stopped the honey flow, and the bees returned to the turnips. Was it the dark-blue flower of the lucerne that caused the bees to forsake the creamy yellow flower of the turnip, or the superior quantity of honey contained in the lucerne? Undoubtedly the latter. The whole family of trefoils are well known to be great honey-producers.

Whatever may have been the reason for plants to have brightly-coloured flowers, and to be otherwise decorated so as to attract insects to aid in the work of the development of the vegetable world in past ages, it is evident

in these latter times the bees at least have been sufficiently educated to go without leading strings, and have kicked over the traces, and now work according to their own sweet will, or a Higher One.

Darwin himself is not quite sure that the colours and markings of flowers in every case are for the sole purpose of attracting bees.

I have before remarked that bees do not work indiscriminately on every species of flower that comes to hand, notwithstanding they are all honey-producers; but one peregrination is confined to collecting from one species, and in the next ramble they may select another, and so on. Whatever species of flower they may select to gather from, it is not the colour of the bloom that is the attraction. In watching bees at work on a bed of poppies, the brightly-coloured flowers are not chosen in preference to white. Any colour in the bed is as attractive as that of any other.

"Bees repeatedly passed in a direct line from one variety to another of the same species, although they bore very differently-coloured flowers. I observed also bees flying in a straight line from one clump of yellow-flowered *Œnthera* to every clump of the same plant in the garden without turning an inch from their course to plants of *Eschocholtzia*, and others with yellow flowers, which lay only a foot or two on either side. In these cases the bees knew the position of each plant in the garden . . . . so that they were guided by experience and memory."* The experience they had gained was that *Œnthera* contained more food than *Eschocholtzia*, and Nature had taught them that it would be impossible to impregnate the ovaries of the one with the pollen of the other.

What is our Australian experience as it regards the colour of flowers that are chiefly visited by bees? There is no denying that some of our endemic flowers are as brightly coloured as the exotic; and, before the introduction of foreign plants and the bee (*Apis mellifica*), the chief honey-gathering social insect was the little native bee (*Trigona carbonaria*), one of the chief insect fertilisers in Australia. The chief honey-yielding plants in these States are the *Pittosporum* and the tea-tree (*Leptospermum* family). The colour of the native flowers named are whitish, with a few exceptions. The chief exotics that have been introduced are fruit-bearing and ornamental flowering plants, which nearly in all cases bear brightly-coloured flowers or blossoms. The exotic, white, flowering fruit-trees in the spring-time are very conspicuous by the multiplicity of the blooms they bear; yet our little native bees now as readily find the nectary in them as our introduced bees, and they cannot have had ages of experience to guide them.

On the other hand, it is very singular that the hive-bee, on its introduction into Australia, and before it had been sufficiently colonised, should forsake the highly-coloured garden flowers of the Old World that were introduced here at about the same time as the bee. These highly-coloured flowers and the hive-bee, as far as Australia is concerned, are coeval. Untold generations of them had learned to work these blooms, we are informed, and their

* Darwin in "Cross and Self Fertilisation of Plants."

experience had greatly aided in the development of species and the production of showy flowers of the land of our fathers. On the introduction of the bees and the flowers referred to, the former appear to have suddenly turned their attention from the latter, and apprenticed themselves to the work of attending to the whitish native honey-bearing flowers of the Colony—a colour that the writers on the subject say the bees studiously avoid for the more gorgeously-coloured ones their progenitors had been at such pains to produce by erecting those bright-coloured signs for the benefit of the bees of to-day, for the purpose of saving them both time and labour. Nevertheless, the hive-bee, when introduced here, after having been educated to the highest standard in the recognition of colours they are said to possess in Europe, have started *de novo*, and worked upon, not our introduced ornamental flowers, nor our showy blooms of "red, blue, and purple," but upon "simple white or yellow ones"; so unlike the education in colours they had received in the other side of the world. Question—Will our eucalypti and acacias, and other white and yellow flora, in ages to come, develop highly-coloured flowers and of a larger size than at present, and will the bees then forsake the colours they now work upon in the same way they are said to have done in the other parts of the world? It is queer bees should have gone back in their tastes for colours, when they crossed the equator in coming to this side of the world.

Some years ago a series of questions were submitted by the Department of Agriculture to the bee-keepers of this State, relative to what plants were visited by bees as regards size and colour of blooms.

In the ranks of the bee-keepers are men of keen observation as to whence their honey flow comes. The whole of the answers given are full of interest. Of course, the imported fruit-trees and other exotic flowering plants are named as giving the spring supply of pollen and honey, but the ironbark, grey gum, bloodwood, blue gums, and the eucalypts generally are by far the most remarkable as honey-yielding, and all these have white flowers. On the northern districts the broad and narrow-leaved tea-tree is stated "to be the largest honey-yielder we have"; therefore its *white* flowers are the attraction. One bee-keeper states that "one year he grew a plot of *white* poppies for experiments with opium, and found the flowers literally crowded from daylight to dark with bees."

The report concludes by saying, "Regarding the size and colour of flowers most affected by the bees, much diversity of opinion exists among apiarists." . . . . It is, indeed, an open question if colour has any effect in the matter." In the report one observing bee-keeper quaintly observes, "The bee is quite indifferent to the size of a flower, provided he can get what he wants"; and, from experience, I can add, quite indifferent as to colour.

Diseases of Fowls.

[Continued from page 58.]

G. BRADSHAW.

The Chicken Mite.

In an earlier *Gazette* the above pest was dealt with under the head of "External parasites." The following report on the same subject has been issued by the Iowa Experimental Station, U.S.A., and is the most exhaustive on the subject yet published, and worth reproduction. The observations were taken by Mr. J. J. Repp, V.M.D., and are as follow:—

One of the most formidable enemies of chickens is unquestionably the chicken mite, scientifically called *Dermanyssus gallinæ* (Redi). My observations have demonstrated that chickens infested with mites are exceedingly unprofitable. The cost of keeping them is increased, and the income from them is very much reduced; indeed, when very badly infested, they are totally incapacitated for performing work.

The hen will cease laying. The ovaries undergo atrophy, and on autopsy will be found shrunken, and in a condition unsuitable for work. In several flocks on which I made observation, I found that egg production was greatly reduced or altogether prevented during the spring and summer, when, under normal conditions, it would have been at its height.

Hatching hens will often either die on the nest as a result of the mite infestation, or will leave their eggs, literally driven away by the vast hordes of mites which accumulate upon them. In the case of three hens which thus died on the nest in one flock of sixteen hens, I could not find any tissue change on post-mortem examination which would account for death. There was, however, an anæmia, or impoverished condition of the blood, such as would be produced by the sucking of the blood by the mites.

The following is an extract from my autopsy record, which will serve for all three cases:—"Subject, a light Brahma hen, found dead on the nest after sitting for nearly three weeks. Her skin and feathers were swarming with mites, although there were a few white lice, the *Menopon pallidum* (Nitsch). The body was in fair flesh. The digestive tract was nearly empty; some oats were in the crop, and a small amount of hard, dry fæces in ceca. In each cæcum were found about a dozen worms—which I identified as the *Heterakis papillosa* (Bloch), one of the round worms of the chicken, but they were not in sufficient numbers to exert any harmful effect. The blood was impoverished—a condition accounted for by the sucking of the blood by the mites. All the organs were normal, as far as could be determined by the naked eye. Death could be accounted for only by the mite infestation.

Another very important feature of the evil effects of mites is the injury they do to new-born chicks. If the hen survives the ordeal to which she is subjected while hatching, the young chicks are attacked by the mites in great swarms as soon as they leave the protection of the shell, and, as a rule, the majority of them will succumb. I have known the loss of new-born chicks from this cause to reach 90 per cent.

Chickens, both old and young, will become reduced in flesh, and lose the energy for hunting and scratching which is so necessary to their welfare. The feathers will become roughened and drop out, the head will become pale, and the chickens in every way present an unthrifty and unhealthy appearance. Broilers which are being prepared for market will not thrive well and will turn out in the end to be unprofitable; in fact, a loss to the owner. In addition to the sucking of blood, the mites reduce the vitality of the fowls by biting them and disturbing their rest at night. The birds require more food, and are at the same time incapable of converting it into tissue and energy as would be done by healthy fowls.

Description of the Mite.

The chicken mite is commonly considered a form of insect life, although it is not, properly speaking, an insect. It is sometimes called the chicken tick, or poultry tick. It would probably be better to apply the term tick to this parasite, and reserve the word mite for the true itch mite of chickens, the *Sarcoptes nutans* (Robin and Lanquetin). The mite has an average length of one twenty-fifth of an inch, and its width is about four-fifths of its length. It has eight legs by means of which it can move very rapidly from place to place. In colour it is light grey with small dark spots showing through the skin.

About one in fifty or one hundred shows a distinctively red colour, varying from a light to a dark red. This red colour is due to engorgement with blood. The common white louse of the hen, *Menopon pallidum* (Nitsch), is longer than the mite and of a yellowish-white colour. Much aid will be given by a hand magnifier.

The mites are of peculiar and stealthy habits of life, rather unlike that which one naturally expects from a parasite. Indeed they are only semi-parasitic, and, as a rule, remain upon the fowl only long enough to secure a meal. They are very active in their movements, and seem to be ever on the lookout for a victim.

On account of their vigorous and vicious habits they may be styled the wolves of the insect parasites of fowls. The mites hide in crevices and under objects in the hen-house during the daytime while the chickens are outside, and lie in wait for their return. They lay their eggs and the young are hatched in these hiding places. A barrel affords an excellent hiding and breeding place, as the mites lodge between the staves and under the hoops. In the nests they are found to be under the straw or other nesting material. It is a noteworthy fact that a place which shows only a few mites on the surface may contain vast numbers in the crevices or under objects.

Often they become so plentiful that they overflow the hiding-places and appear in hordes upon the exposed surfaces. I have observed them so thickly settled as to cover the upper edge of an inch board and down the sides for a distance of 2 inches throughout 4 feet of its length, and at the same time in almost as great numbers in neighbouring places. On one occasion when the upper border of the nest-box was covered by mites, as above described, a hen went upon the nest to lay. Within ten minutes I noticed that at least three-fourths of the mites had left their position on the box. On lifting off the hen and examining her I found her to be swarming with mites.

Introduction of Mites into a Flock.

In one case I was able to determine with certainty that the mites were introduced into a flock by a rooster that had been bought in a neighbouring flock, which proved on examination to be badly infected with mites. There is no doubt that mites may be carried from one premises to another upon all sorts of intermediate bearers.

To provide against infection of a flock in this manner any new fowls which are brought in from infected premises should be quarantined and treated by dusting with pyrethrum powder until all the mites have been destroyed.

Extermination of Chicken Mites.

In one case I tried to exterminate the mites in a hen-house by means of fire applied with a torch, but the attempt was unsuccessful. The flame was applied to the mites that were visible, and they were destroyed. But the process was slow, and care had to be taken so as not to set fire to the building. As soon as the interior had all been gone over once, it was found that the mites covered it as thickly as before, they having crawled out from their hiding-places. It was necessary to go over it several times before the number appeared to appreciably diminish, and in a few days they were as plentiful as ever. The application of the flame to all parts is a very slow process, and is attended with some danger. It cannot be directed into the crevices so as to destroy the eggs or the mites which are in hiding. My experience convinces me that it is impracticable to exterminate mites by means of the flame. The only way in which fire could be made effective would be to burn the entire building.

I next resorted to the use of kerosene emulsion, and found it very effective. The emulsion is made as follows :—

Take one half-pound of hard soap, shave it into a gallon of soft water ; put it on the fire and bring it to a boil. By this time the soap will have dissolved. Then remove the soap solution from the fire, and stir into it at once, while hot, 2 gallons of kerosene. This makes a thick creamy emulsion, which is made ready for use by diluting with 10 volumes of soft water and stirring well. It can be utilised as a spray, dip, or wash.

It is necessary to use soft water, for hard water decomposes the soap and destroys its emulsifying power. In my experiments I used white laundry soap, but any good hard soap will do.

Make up as much of the stock emulsion as it is thought will be needed. This can be kept in a suitable vessel and a portion taken out and diluted as needed. If the bucket or holder attached to the spray-pump holds 5 gallons, one half gallon of the stock emulsion should be taken and put into the bucket or holder and 4½ gallons of soft water added, and the whole well stirred. It is then ready to be sprayed on the places occupied by the mites.

A beginning should be made at a particular place and the whole habitation of the mites sprayed in a regular order, of which account should be taken so that the same order may be followed in subsequent spraying. The spray should be directed with special care into all crevices, holes, joints, and other hiding and breeding places of the mites. The first spray of kerosene emulsion will kill within five minutes all of the mites and eggs with which it comes into contact; but many mites will be left in the hiding-places unaffected by the spray.

The spraying, therefore, should be repeated as soon as the first spraying is completed. Even this will not kill all of the mites, hence a third spraying should be done as soon as the second is completed. At each repetition the beginning should be made at the same place, and the same order followed as in the first. These three sprayings done in one day and in rapid succession will destroy nearly all of the mites, but, as my researches have shown, many eggs are left in places untouched by the spray.

If mites are seen crawling about the building the next day, it should be sprayed again. One might ordinarily suppose that he had now exterminated the mites. But such is not the case, for, in about three days, a crop of young mites will be found hatched from the eggs that escaped the first spraying. If these were allowed to go undisturbed it would not be long ere the building would be as badly infested as at the beginning. Therefore the spraying should be repeated every three or four days, spraying two or three times on each occasion, for about two weeks.

It is not necessary nor advisable to exclude the chickens from their regular coop while the process of extermination is going on, except while the spraying is in progress. If the chickens are deprived of their regular quarters they will be compelled to select temporary quarters, which will soon be as badly infested with mites as in the old, through multiplication of the mites which are carried on the bodies of the fowls. If the chickens are not required to make a new roosting-place, the mites which are carried out by them will either drop off upon the ground and perish, or will crawl off into the crevices about the roost and be killed by subsequent sprayings.

In one case, a sack of corn which had been in a hen-house, and was swarming with mites, was removed to a distant building, which was not occupied by fowls of any kind. No attempt was made to destroy the mites, yet in two weeks they had all disappeared.

Their death was doubtless due to the fact that they had no host upon which to feed. This observation leads to the supposition that if the fowls were kept away from a building infested with mites, the mites would entirely disappear within a few weeks. In practice, however, it would be inadvisable to attempt to get rid of the mites in a certain coop by keeping the fowls out of it, and thus starving the mites; for, while the mites would thus be destroyed in the regular hen-house, the temporary roosting-place would likely soon be as badly infested as the old.

A sugar-barrel which was used as a nesting-place by the hens, and which was swarming with mites, was sprayed with kerosene emulsion. Afterwards a hoop was removed, and was found to be covered on the inside with a large number of mite eggs. These eggs had been thoroughly moistened by the spray, and the mites upon the hoop had been killed. A piece of the hoop was cut out and placed under a glass dish. The air was kept moist by placing under the glass dish a smaller dish containing water. Other pieces of the hoop were left lying in an outbuilding, so that they might be under conditions as nearly natural as possible. Observations were kept up for nine days, but the eggs failed to hatch, and were at the end of this time shrunken, and evidently in such a condition that subsequent hatching was impossible.

Summary.

The chicken mite is one of the worst enemies of chickens.

The mites live and breed in fissures about buildings, and feed upon the fowls when they go upon the nest or perch.

Mites may be introduced into a flock by a fowl or other bearer brought from infected premises.

Mites may be exterminated by thoroughly spraying the building and its contents with kerosene emulsion.

Kerosene emulsion kills not only the mites but also their eggs, when it comes into contact with them.

Apoplexy.

This ailment is associated with male birds more frequently than with hens. The symptoms are giddiness, awkwardness of gait, the head and comb become quite dark in colour; then the bird suddenly falls down, struggles, and, if not attended to, often dies.

Every keeper of poultry has had experience of the disease, and although he may not have been a witness to the symptoms mentioned, is familiar with the results, it being nothing unusual to have seen his flock all on their perches of a night, apparently healthy, and in the morning finding one dead under the perch.

Attacks are very easily prompted in birds subject to the trouble. A fright will bring it on; if hungry, rushing their food may cause an attack; while an attempt to catch the fowls in the yard is at times responsible for a death from apoplexy.

Hens are sometimes found dead on the nest after laying, from the same cause; intense heat or excitement may also bring it on. High feeding is the principal cause of the ailment, overfat specimens being frequent subjects, while some authorities think it may be inherited from parents which have been highly fed; at any rate, fowls which are kept penned and liberally fed are most subject to it.

Another term for the ailment being congestion of the brain, a small blood vessel of the brain breaking, usually causing the attack. As with other parts of the muscular system, the little arteries suffer from fatty degeneration. which weakens the wall, and is thus unable to resist the pressure caused by over-excitement which is brought to bear on the brain vessels; some of them are ruptured, and serious results follow.

Some authorities say that the deaths resulting from extreme heat are not apoplexy proper, for although due to pressure on the brain, there is no clot of blood found as in apoplexy.

Remedial.—When a fowl is attacked it should be treated at once, or death may ensue. The first thing to do, and usually effective, is to bleed the bird by opening the large vein found under the wing with a sharp penknife, and allow say two teaspoonsful of blood to flow.

Preceding the operation cold water should be thrown over the bird's head, which at times brings about a recovery, but bleeding is the most effective. Following this the bird should be placed in a pen by itself, given some Epsom salts in its drinking water, and fed sparingly.

At the same time fowls prone to apoplexy are rarely profitable to their owners; even when cured of attacks they should be got rid of at the earliest opportunity.

Preventive measures are in the way of correct feeding; a diet consisting largely of maize provoking the disease. Fowls having a free range, with herbage at will, are rarely apopletic.

Diarrhœa, Dysentery, &c.

Intestinal troubles in fowls are of many sorts and degrees, from simple diarrhœa to the almost incurable dysentery. The intestines form a large part of the alimentary canal, and runs from the mouth of the fowl right

through the system, terminating in the clocæ, just inside the vent. The intestines (two) are, of course, part of the digestive system. The small one runs from the gizzard to the large intestine. It contains the substance which aids digestion, thus completing the assimilation of the food, the portion retained going to nourish the system, the waste material passing on to the large intestine, then conveyed to the clocæ, and ejected as droppings.

Diarrhœa, or looseness of the bowels, in fowls is brought on by some irritating matter, such as sour and unwholesome food or exposure, cold, wet weather, and other causes.

The symptoms are excessive discharge from the bowels.

Diarrhœa is responsible for very great mortality among chickens, some poultry-keepers losing a greater number from this cause than from any other chicken ailment.

In America of late years a chicken disease, termed "White Diarrhœa," has become prevalent, and has baffled the best poultry doctors in that country. It is, however, confined to incubator-hatched chickens, not due to that cause, but to something not yet understood in artificial rearing; and, as the chicks are only a week or two old when attacked, it is quite conceivable the difficulty in curing intestinal disarrangements at such an early age. But even in this country, where artificial incubation is less general than in America, the trouble is experienced, while those hen-hatched and reared are sometimes victims.

The existence of diarrhœa in adult fowls is usually due to the presence of some foreign, fetid, or irritant matter in the intestines, and to get rid of that is to usually cure the complaint. The first treatment should be a teaspoonful of salad oil, sweet oil, or a rather smaller quantity of castor-oil, or a dose, about 25 grains, of Epsom salts. Boiled rice, into which some powdered chalk has been mixed, should be given a few hours after the purgative, and, if not effective, pills made of 4 grains of prepared chalk, 4 grains of rhubarb, and 1 grain of opium should be given.

Lewis Wright quotes 5 grains chalk, 5 grains rhubarb, and 3 grains cayenne—a pill given morning and night.

Rhubarb pills can be purchased at any chemist's, which will often be effective in arresting the complaint.

I have cured a number of cases with pills made of powdered chalk and lard only.

Camphorated spirits is another useful remedy. The simplest way is to make a pill of ordinary bread, and work about 10 drops of the spirit into it A little alum in the drinking water is also useful.

Sometimes a case of simple diarrhœa may have developed into dysentery before the poultry-keeper is aware of any ailment. In such cases the odds are against the birds, the best remedies to try being a dose of castor-oil, followed by 5 drops of laudanum every three hours.

Dr. Collis Brown's chlorodyne, in small doses, has also proved effective.

What is known as chalky or white diarrhœa in young chickens, has baffled the most prominent investigators in America. Dr. Woodroff Hill,

in his "Diseases of Poultry," says:—"The causes of diarrhœa in poultry are much the same as those affecting other creatures, and may be invariably traced (apart from constitutional disease) to injudicious dietary arrangement."

Symptoms.—The frequent evacuation of loose or liquid fæces, usually of a frothy and watery nature.

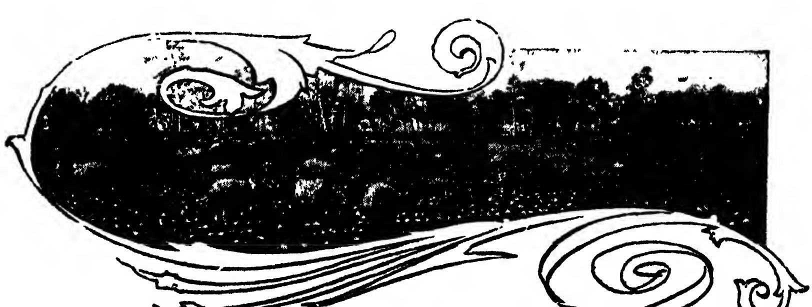
Treatment.—A teaspoonful of castor-oil, followed by 5 grains of rhubarb, and 10 grains of carbonate of soda, or a grain of opium. Chlorodyne, 3 to 6 drops in a dessertspoonful of water or Port wine, is especially serviceable. In severe cases I have found a pill containing a grain each of tannic acid and opium effectual. Diarrhœa, however, is almost invariably due to the presence of irritating matter, and should, therefore, not be checked at the outset with astringents, which are so often and unwisely prescribed.

During the attack, and for a little time after its abatement, the bird should be fed on soft food, and have no green vegetables.

For young chicks, half a teaspoonful of salad-oil is preferable to castor-oil, and chlorodyne should be given in 1-drop doses in a teaspoonful of warm milk or barley water.

The doses particularised above are for a medium-sized fowl.

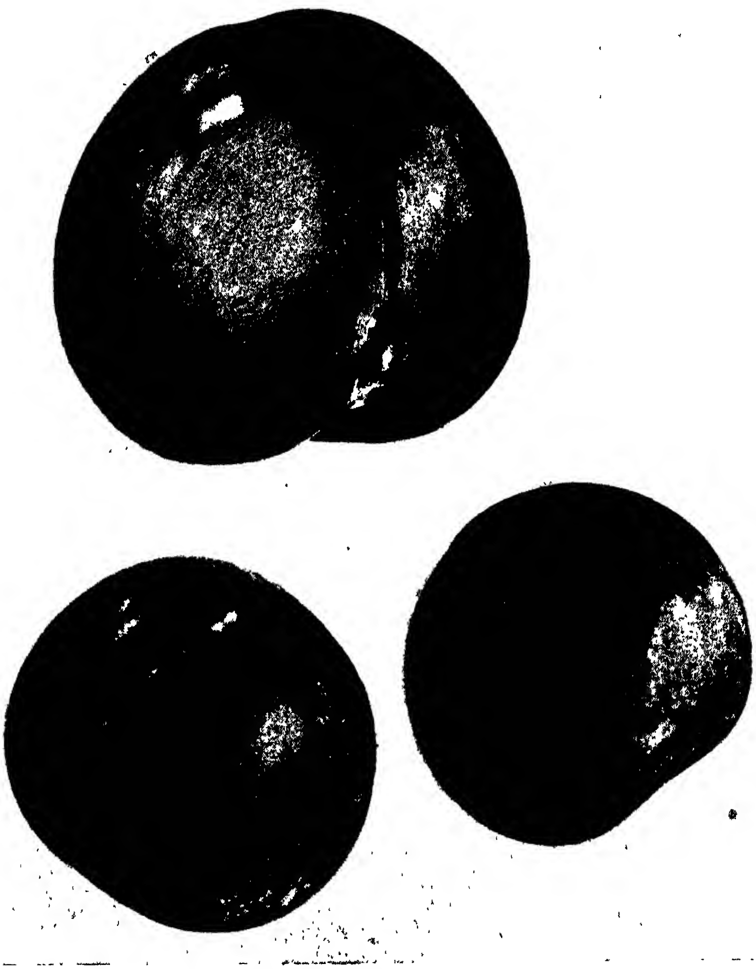
(*To be continued.*)



Irrigation with Household Waste Water.

H. SELKIRK, Killara.

In dry seasons, the great advantage to the gardener of being in a position to utilise all waste water from the house cannot be too strongly emphasised,



October Purple Plums.

The large plum at the top represents a fair sample of the irrigated fruit, while the two smaller plums are an average sample of the unirrigated; the illustration is natural size.

and having personally benefited in this respect, my experience may possibly be of use to others who are somewhat similarly circumstanced.

My garden is situated on a gentle slope, the house being on the highest point, with the land falling away in front.

Residing in a suburb which is not connected with any system of sewerage, the problem of how best to dispose of refuse water from kitchen, laundry, and bathroom cropped up, and as a temporary expedient it was carried by pipes into vacant land, where it was consumed by a young growth of native vegetation. Subsequently, the necessity arising for a better arrangement, two lines of 4-inch drain pipes were carried down the slope, one connecting with the bathroom, and the other with kitchen and laundry; these were so graded as to discharge on the surface at suitable points in the garden. To prevent any one spot becoming sodden and probably offensive, the discharge was directed by means of some lengths of ordinary galvanized guttering, first to one point, then to others as desired, and by running furrows across the slope with a Planet Junior Hand Cultivator, the water was still further distributed, resulting in a simple, inexpensive, and thoroughly effective system of irrigation on a small scale.

As a practical result, I may give two instances. Potatoes were planted under precisely similar conditions of cultivation on opposite sides of the garden, about 25 lb. of seed in each case. Bed No. 1 could not be irrigated, but bed No. 2 had the water run between the rows several times during the growing period. The crop from No. 1 was almost a failure, giving little but marbles, while No. 2 gave a full, even crop of large tubers of extra fine quality, sufficient to supply all family wants for several months, and this at a time when good potatoes were both hard to get and expensive to buy.

In the second instance, two plum trees, of the variety known as October Purple, received similar treatment to the potatoes. In the case of no water a small crop resulted, averaging about 1¼ oz. per fruit; in the other case, where the tree was irrigated, a full crop of fruit was carried, a large proportion of which ran 3½ oz. per fruit, while fruit trees of other varieties benefited in like degree.

If results such as those instanced can be obtained in a disastrous season like the present, which has been almost without parallel in the metropolitan coastal district for its droughty conditions, surely the small initial outlay requisite should not deter the gardener from placing himself in a position, by simple means, to thus turn waste and noxious material into luscious fruit and wholesome vegetables.

Progress Report from Mr. W. W. Froggatt.

[MR FROGGATT is travelling on behalf of the Governments of Queensland, New South Wales, Victoria, and South Australia, in quest of means of combating the Fruit fly and Codling moth pests, and other fruit and plant diseases.]

R.M.S. "Morro Castle," Gulf of Mexico,
29th November, 1907.

Sir,

I have the honor herewith to forward to you a progress report of my movements since I left Washington, D.C., on October 15th.

Accompanied by Dr. L. C. Howard (Chief of the Entomological Division, United States Department of Agriculture), left Washington for New Orleans at 9 a.m., passed through Virginia, North Carolina, South Carolina, Alabama, and reached New Orleans at 10·30 p.m., on the night of the 16th. After passing through Virginia we came into tobacco and cotton country, the greater part of which is sublet, right into Texas, to the negroes who work it on the shares system. The landowner finds the land, mule, seed, and pays the negroes' store bill till the crop is taken off, so always has his tenants in debt. A good crop is a bale to the acre, 500 lb., worth at present about 55 dollars, or slightly over 10 cents a lb., but it has been down to 5 cents, which is the estimated cost of production. Roughly, 40 dollars an acre is a good harvest, which the landowner and tenant divide; so that after the cost of production is taken into account, the value per acre is not great. However, where the cotton-boll weevil (*Anthimonis grandis*) has spread, the yield over many thousand acres in the greater part of Texas and Western Louisiana, has been reduced to half a bale an acre, and it has only been the high price of cotton that has kept thousands of acres from going out of cultivation. The cotton seed is of some value for oil-making, cattle food, and manure; it is hoped that the stalks may be used for the manufacture of paper, and experiments are being carried out to test this product. This halves system has led to very poor cultivation, and the tenant does not take any trouble to clear up the dead cotton plants after the crop is gathered, and so it is thus very difficult to deal with the boll weevil, which is spreading northwards at the rate of thirty miles a year, has crossed the Mississippi River, and is now at Baton Rouge.

At New Orleans, Professor Hunter (who is in charge of the Agricultural Experiment Station at Dallas, Texas) met us, and we went on next day to the Agricultural Station at Baton Rouge, and the Pest Crop Commission of Louisiana officers, under the charge of Mr. Newell, where experiments dealing with the cattle tick, boll weevil, and other pests are being carried out. These laboratories are fitted out in a very elaborate style and a regular staff, engaged under the State Government. The chief methods advocated in tick extermination are starving them out of each paddock by removing all stock, and thus gradually decreasing the infested area, and smearing all stock, but they discourage dipping.

An introduced ant (*Iridomyscomisc humilis*) allied to several of our species, which is said to have been introduced from Buenos Ayres, South America, is a very serious house pest all over this State, and is also spreading very rapidly. We left on the same day for Shrieveport, and arrived there at 10·30 p.m. the same night, and next morning visited Mr. Hood's office, where experiments are being carried on with parasites of the cotton-boll weevil, left the same morning for Dallas, and arrived there at 8·30 p.m.

Sunday morning was spent at the Agricultural Station, where a staff of seven entomologists and field agents are working at the control of the weevil by mechanical methods, the discovery of parasites, or the production of a hardy, or early-developing variety of cotton. At one time this year 17,000 weevils were under observation. Visited the Agricultural Show with Professor Hunter, and saw all the prize stock, some very fine mules, only about 20 sheep. Mixed cattle and "red hogs" predominate, though Berkshires were also well represented. Visited the cotton mills, where an automatic draught sucks the cotton out of the carts and carries it into the storeroom (Murrey's patent); gave the staff an address on economic entomology in Australia in the evening.

On the 22nd we left for Houston, stopping at College Station, where the Agricultural and Technical College of Texas is situated, and containing 600 students and a staff of about 50 masters and teachers, It is run somewhat upon the lines of the Hawkesbury Agricultural College; but they also teach technical work, and have a complete cotton mill with looms, ironwork, &c. The students do all the washing and laundry work themselves; it was washing day when I went round with the President. This College is so popular that the rooms are all occupied, and over 60 students were camped in tents on the campus. This College is under State control, and consists of 800 acres of good land. Dr. Howard having finished his business, we left at 4 o'clock and reached Houston at 10 p.m. Next day we visited Galveston, and saw the Medical College, where such good work was done during the yellow fever epidemic, four years ago, in dealing with the mosquitoes. Returning the same afternoon, we left for Victoria, but stopped on the road, at the invitation of the Manager of the Pierce Ranch, one of the largest in the district, where they have introduced a number of different kinds of Bramah cattle from India and crossed them with the large Texas cows. These bulls are very large, handsome, quiet animals, and the cross have also a very fine, close hair, It is claimed that the bulls and their stock are tick-proof. The suggestion is that the close, short hair causes the larval ticks when they moult to drop off, as they have nothing to cling to. Rice, cotton, lucerne, &c., are also grown on this ranch, which consists of 70,000 acres of rich prairie country. Went on next morning to Victoria, where the Department of Agriculture have a small station, and after seeing the Officer-in-Charge, left for San Antonio, and arrived there the same evening. The following day was spent in arranging to go on to Mexico, and Professor Hunter returned to Dallas and Dr. Howard to Washington. On the 26th October, 1907, I left for Mexico City, *viâ* Laredo, the border town, reaching my destination at 6 a.m. on Monday, the 28th. Here my friend, Mr. A. Koebele, the well-known Californian entomologist, met me, and with him I made my head-quarters at the Iturbide Hotel.

In Mexico I placed myself in the hands of the Department of Fomento (Department for the Promotion of Information). Professor Herrera, Chief of the Entomological Branch, was away sick, and there were three "Festa Days" coming together at the end of the month, so nothing could be done in the field for three days. The Secretary introduced me to Dr. Giandra, next in charge, who made arrangements to engage an interpreter for me and go down to the town of Yutapec, in the Mirelas country, the chief centre of the orange industry. Spent the rest of the time in learning about the raw products of the country, visiting the native fruit markets, and, under Mr. Koebele's guidance, the districts round the city, where there are many small orchards, but in a very neglected state and badly cultivated. One of the chief industries in fruit is growing strawberries for the city restaurants. On the road to Tres Marias, visited the Agricultural Show held this week, where

there was a very fine exhibit of cattle, chiefly Holland and Swiss, but a consignment of Herefords brought over from California were sold by auction and brought very poor prices. All the horses were English, imported or bred from English stock, and were very fine animals; poultry were very well represented, so were pigeons and rabbits. Sheep, as usual, poor, and represented by only two pens of Cotswold

On the 5th November, left for Yutapec at 7 a.m. Dr. Giandar was to have gone down with me, but missed the train; arrived there at 3 p.m., where the Mayor, his Secretary, the Chief of Police, Chief Fruit Inspector, and a mounted escort met me and took me to a house, where I lived with a bodyguard of a policeman and a solicitor during my stay. The orchards of Yutapec consist chiefly of oranges, the valley is rich black soil, and is all under irrigation; all the trees are seedlings and of considerable size, and grown in a very irregular manner. The growers know nothing about pruning, grafting, or budding, and apparently never cut out a diseased tree until it dies out or is blown down; but the ground is so rich and the climate semi-tropical, so that they nearly always have a crop of fruit. The fruit is large, well flavoured, and contains very few seeds. This district is the only one where oranges are grown for export, and the Entomological Division have advised the State officials, who have passed laws to compel the growers to clean up their orchards by burning or burying the infested fruit and windfalls. The expense of making the furnaces, inspecting the fruit, destroying the old wooden fences, and replacing them with barbed wire, and the payment of the Inspector's salaries is borne by the Federal Commission, the State authorities seeing that the regulations are carried out, even to arresting a man who will not clean up his orchard, or notify the Inspectors when he is going to gather his fruit. Any fruit arriving at a railway station without an Inspector's certificate is not allowed to go on the train, and the owner has to get an Inspector, when he is ready, to examine it there. Where wood is scarce all the oranges are gathered into heaps, and the Inspectors first punch a hole into the end of each orange and the next one injects benzine into it with a glass syringe, plugging up the hole with some clay. I saw two men treat 358 oranges in forty minutes; it is claimed that the benzine kills every maggot, and these oranges are then allowed to rot on the ground. I doubt if this treatment kills all the maggots, even if cheaper than burning. Labour, however, is cheap, the Chief Inspector gets 75 cents (1s. 6d.) and the assistant 50 cents (1s.) for twelve hours' work. The oranges are examined while being placed in the crates, and the Inspectors are very expert in detecting damaged fruit. They are counted in threes, two hands of three, or 53 hands 318 oranges to a crate. These crates are carried to the railway on mules, and the oranges are worth 25 cents a hundred in the orchard (English money, 6d.). The wild oranges, which are sour and are made into wine, are gathered and sold for 3 cents (1d.) per hundred

Most of the orchards are small, ranging from 50 to 500 trees in this district, and other parts of Central Mexico, but larger orchards are now being planted in the north, more on American plans. The Department, which naturally wishes to keep their export market in the United States open, claims that fruit fly is only found in this State attacking oranges, but I have found records that it is found in other districts, and it probably has an extended range, but the methods they are enforcing in Mirelas State is greatly reducing the pest.

I could not find that the parasite recorded from Mexico, on the orange maggot, was of any value in checking the pest.

On returning to Mexico City I made several visits to different districts, and several days at the Department with Professor Herrera, obtaining

information regarding the pests of agriculture, which I have recorded for my report, but will not enlarge upon here.

Acting upon the advice of Professor Herrera, and armed with credentials from him to the Jefe Political, or Chief Magistrate of the different districts, I left Mexico City, on the 15th November, for Puebla, reaching there late in the afternoon, where I engaged an interpreter and visited the Governor's Secretary, who gave me letters to the President of the University of State, where there was a small collection of Mexican insects, and with a letter to the Mayor of Tehuacan, left for that town at 6 a.m. on Sunday morning, reaching there at midday, and met two of the chief ranch owners of the town and went to the fruit market. Here I was told that a white grub often destroys a great deal of the maize by gnawing off the roots. Maize, barley, and fruit are the chief crops grown by irrigation, but hardly anything is exported. On the 18th November I left Puebla for Orizaba, and reached that town at 3.30 p.m. the same afternoon, where I obtained an interpreter and called upon the Judge of the district at the Court House, who gave me letters to the managers of the two large plantations in the neighbourhood, San Antino and Galapella, which I visited next morning, going through the orange orchards which were free from scale and fruit fly, but badly infested with melanose, and, as the oranges are not used for sale, they are much neglected. Drove through coffee plantations and sugar cane, visited the mill, a very primitive affair, with one pair of rollers, the sugar is all made up into loaves; the loaf sugar of three grades; a large amount of raw spirit is also manufactured. In another orchard visited I noticed a very curious mandarin orange tree, with short sessile leaves, almost like holly.

On the 20th I left for Vera Cruz, passing through large tracts of coffee grown under shade trees and banana plantations, between Orizaba and Cordoba. Arriving at Vera Cruz the same afternoon I found an interpreter, and called upon the Chief Magistrate, who advised me to go down to the tropical country of the Isthmus, and offered to give me a letter to his brother, the owner of a large ranch and plantation; this I accepted.

Finding there was a boat going down the coast to Coatxacualas, I made my arrangements to leave, and though the boat was advertised to leave early in the day, did not get away till dark. After a smooth passage of about 100 miles, arrived at the mouth of the river at midday, when I found an Indian with a canoe, and engaged him to row me up to Signor Ignacio Velo's, about six miles up a lagoon, and arrived there that evening. Here I spent two very interesting days, where the estate consists of 6,000 acres of rich tropical land, growing vanilla, coffee, and oranges. He also supplies the town with milk, and grows coral grass on the swampy land, which he cuts and sells in bundles for the town horses. He has 500 cocoanut trees, and is planting out more. His cattle are chiefly of the Mexican type, but he has imported four fine Holstein bulls from California, and is a very enterprising man. On Sunday night I returned to the town, and on Monday morning left Coatxacualas for San Lucrecia, the junction of the train from Vera Cruz and Salona Cruz, on the Pacific Coast. Here I had to remain until 5 a.m. next morning, when I took train to Vera Cruz, and arrived there that night. The following day I packed up, and took my passage in this boat for Cuba and Jamaica, leaving the city at 6 o'clock yesterday.

I have, &c.,
(Sgd.) WALTER W. FROGGATT.

To The Hon. Minister for Agriculture,
Sydney, New South Wales.

The Bot-fly (*Gasterophilus equi*).

WALTER W. FROGGATT,*
Government Entomologist.

As several notices have recently appeared in the newspapers stating that the "Bot-flies" are causing the death of horses in the southern districts of New South Wales, it is advisable for everyone to be on the look-out for them for the season is rapidly approaching when, if there are any of these pests in the neighbourhood, they will emerge from the dormant pupæ buried in the soil and deposit their eggs upon horses.

I therefore propose in these notes to give some account of these flies, their habits and life-history, so that farmers and others interested in stock can recognise both the larval "bots" and mature flies when they come across them.

There is no record of bot-flies having been found in the northern districts of this Colony, and the chief area of infestation is around Wagga, Bombala, on to the Victorian border; but, at the same time, I have seen portions of the stomach of a horse killed at Botany that were thickly covered with the bots, so that it is probable that bots are much more common than is generally suspected.

The bot-flies belong to the family *Œstridæ*, which contains a number of rather large flies with very short antennæ and the front of the head standing out. They are distinguished from all other flies by having the mouth parts obsolete or aborted, and only represented by two or three fleshy tubercles (except in several of the minor genera), and they all have stout wings with few veins. These flies lay their eggs or larvæ upon the hairs or skin of different animals, from which position they work their way through the skin, or gain an entrance into the mouth (by means of the animal licking itself), and make their way into the internal organs Westwood grouped the *Œstridæ* under three heads—*cutaneous*, the warble flies; *cervical*, those attacking the nasal cavities; and *gastric*, those found in the stomach. Those whose larvæ live beneath the skin are generally known as "warbles," as the "ox warble" (*Hypoderma lineata*). In this case the eggs are licked off the hairs of the animal they infest, and thus carried into the mouth; but instead of making for the stomach, they work their way through the tissue to a point immediately beneath the skin, where they remain stationary, forming a warble or lump from which the fly makes its escape through the skin, leaving behind

[* As numerous inquiries for information regarding "Bot-flies" have been made, and as the stock of November, 1900, *Gazettes* and pamphlets is exhausted, Mr. Froggatt's notes are republished. At present Mr. Froggatt, the Government Entomologist, is absent from Australia in quest of information regarding insect pests; there is, therefore, no opportunity for him to supply additional notes on the subject.—SUB-ED.]

an ulcerated fester. The eggs of some species that attack the smaller and softer-skinned animals simply hatch where they are deposited, and the minute larvæ pierce the skin, forming the warble beneath.

The sheep-fly (*Œstrus ovis*) lays its eggs in the nostrils of the unfortunate sheep, from whence the larvæ make their way through the mucus of the nasal passages. The sheep, when badly infested, develop a disease known as "staggers," which sometimes kills numbers.

Many animals appear to be infested with their own particular species; there are about ten species known in England which infest the horse, ox, ass, sheep, and red deer. The camel in Arabia is infested with a large species (*Cephalomyia maculata*), and as Mr. Tepper has recorded the finding of some large bot-larvæ in South Australia, said to have come from the camels, it is probable that it has been introduced into those districts of Australia where camels are used for carrying. Even the smallest animal has its parasite, for at a meeting of the Entomological Society in 1888, Mr. C. O. Waterhouse exhibited the larvæ of an *Œstrus* which measured nearly an inch and a half in length, and was found in the body of a common mouse from Peru, of which it occupied almost the whole of one side.

The true bot-flies belong to the genus *Gasterophilus*, and the common species is known as the horse-bot (*Gasterophilus equi*); it was recorded in Victoria a good many years ago. There may be several species in Australia. Kirk,* writing of the pest in New Zealand, says: "There seems little doubt that we have at least two, if not three, species of horse-bot in this Colony; but that common in the North Island is, undoubtedly, *Gasterophilus equi*, a comparison of New Zealand specimens with types received from England revealing no difference whatever." This species has a very wide range over Europe and North America, and was introduced into New Zealand many years ago, and was also recorded from Victoria some time before it was observed in this Colony.

Naturally, it is very easy for these flies to be introduced into a clean country in the larval state while infesting imported animals; and though I understand that the droppings of all stock in quarantine are burnt, some may be voided after the animals have finished the regular time of detention. I have recently had samples of bots from Fiji, said to have been introduced with mules from America, which is a different species to the common one in Australia.

Though there is no doubt about the damage that the warble-flies of the cattle and the nasal-flies of the sheep do to the animals they infest, there is a great diversity of opinion as to the effects of bot-flies in the internal organs of the horse; some authors even assert that their presence does not hurt the animal at all, but rather has a beneficial effect. Bracey Clark, who published a treatise on these flies in 1796,† was of this opinion, and also the well-known naturalist, Réaumur. Vallsnieri, however, attributed to this cause an

* "Leaflets for Farmers," No. 19, 1895. T. W. Kirk, Department Agriculture, New Zealand.

† Trans. Linnean Society, Vol. III, 1796.

epidemic which killed an immense number of horses in Italy in 1713, as many of the horses dissected were found to have their stomachs full of these larvæ At the present time, most authorities agree that a horse infested with bot-flies in any quantity (and as many as 400 have been taken out of the stomach of a horse), will lose flesh and waste away. Yet it is very rarely that a horse dies from bots ; but where a horse has some other organic disease, the two combined may cause its death, and the bots being found covering the walls of the stomach, are credited with being the sole cause of its death. There can be no question that the local irritation caused by these larvæ, each attached to the membrane by a double hook at the tip of its head. must be very great, though entire perforation of the stomach is very rare.

Life History.—The eggs are dull light brown to dirty white in colour, elongate oval in form, somewhat pointed, and broadest at the apex. The fly deposits them singly upon the hairs, the shell being coated with a sticky substance that glues them on, so that it is a difficult matter to pull them off. I have had hair taken off an infested horse with hundreds of them, but never saw one hatch out in the jars in which they were kept. These eggs are generally deposited on the jaw, shoulders, or flanks of the animal, from whence. through the animal licking itself, they are conveyed to the lips and mouth, the warmth dissolving the gluey secretion and hatching the enclosed maggot, thus enabling it to crawl out into the throat, from which it gains access to the stomach, and takes up the position which it retains, attached to the coating of the stomach until it is fully developed, when it loosens its hold and is carried through the intestines and voided with the dung ; but very soon afterwards it works its way downwards and buries itself in the soil, where it pupates, and from which the perfect fly emerges in about six weeks in the summer time; but the final development is retarded or accelerated by the time of the year in which they are cast out.

The larvæ vary from dull yellow to light reddish-brown, and are of a general oval form, measuring up to $\frac{3}{4}$ of an inch in length and 5 lines in diameter in the centre. The head portion is attenuated and armed with two stout hooks placed back to back, each curving outward, with the mouth between them, and, when in position, these hooks and the mouth are buried in the membrane of the stomach, causing a pit or scar to form, which shows quite distinctly when the bot is detached The segments of the larvæ are very well defined, and each is ringed with a band of regular, short, fleshy spines, tipped with a black point, which, together with the cephalic hooks, are very distinctive characteristics of the bot, by which it can be easily recognised.

The fly is about half an inch in length, the male having the abdomen broad and rounded at the tip, but that of the female is slender and elongated, and is generally carried curled down beneath the base of the body. The head is dark yellow, thickly clothed with short golden-yellow down ; the thorax clothed with fine pale yellow to light brown hairs or down, which gives it the appearance of a hairy bee. The abdominal hairs are lighter along the sides, and intermixed with shorter black ones on the dorsal surface

When flying about it makes a loud humming noise—a sound which the horses seem to recognise instinctively, for as soon as they hear it they gallop about and show decided signs of fear ; yet, as the fly has no mouth, it cannot be caused by the dread of its bite.

Remedies.—There are numbers of different drenches that have been suggested and recommended by stock-owners to destroy or purge out the infesting bots ; but when once the horse is infested internally, it is more a matter for the chemist and the veterinary surgeon to deal with than the entomologist ; but again, quoting from Kirk's paper, he gives Mr. H. Thompson's, M.R.C.V.S., remarks as follows :—"I know of no medicine that will destroy them or make them leave their winter quarters until fully developed. As a medicine, 2 oz. of turpentine and 20 oz. of raw linseed-oil, mixed and given as a draught once a fortnight, is the best remedy, *i.e.*, if it is thought the loss of flesh of the horse is due to bots."

Prevention is better than cure, and in any district where the presence of bot-flies is suspected, a watch should be kept during the early summer, and the horses regularly examined to see if they are egg-infested. The eggs can be easily noticed on the hairs of the jaws, legs, and shoulders. They can be removed by grooming, and the horse rubbed with carbolised oil, or washed with carbolic soap, or other oily substances that will not hurt the skin, but are distasteful to the flies, and will deter them from depositing their eggs upon such evil-smelling coats. These flies are said to dislike dark places, and will not enter stables or sheds ; so that where only one or two horses are kept, if remaining under cover during the time when the flies are about, they would be safe from their attacks.

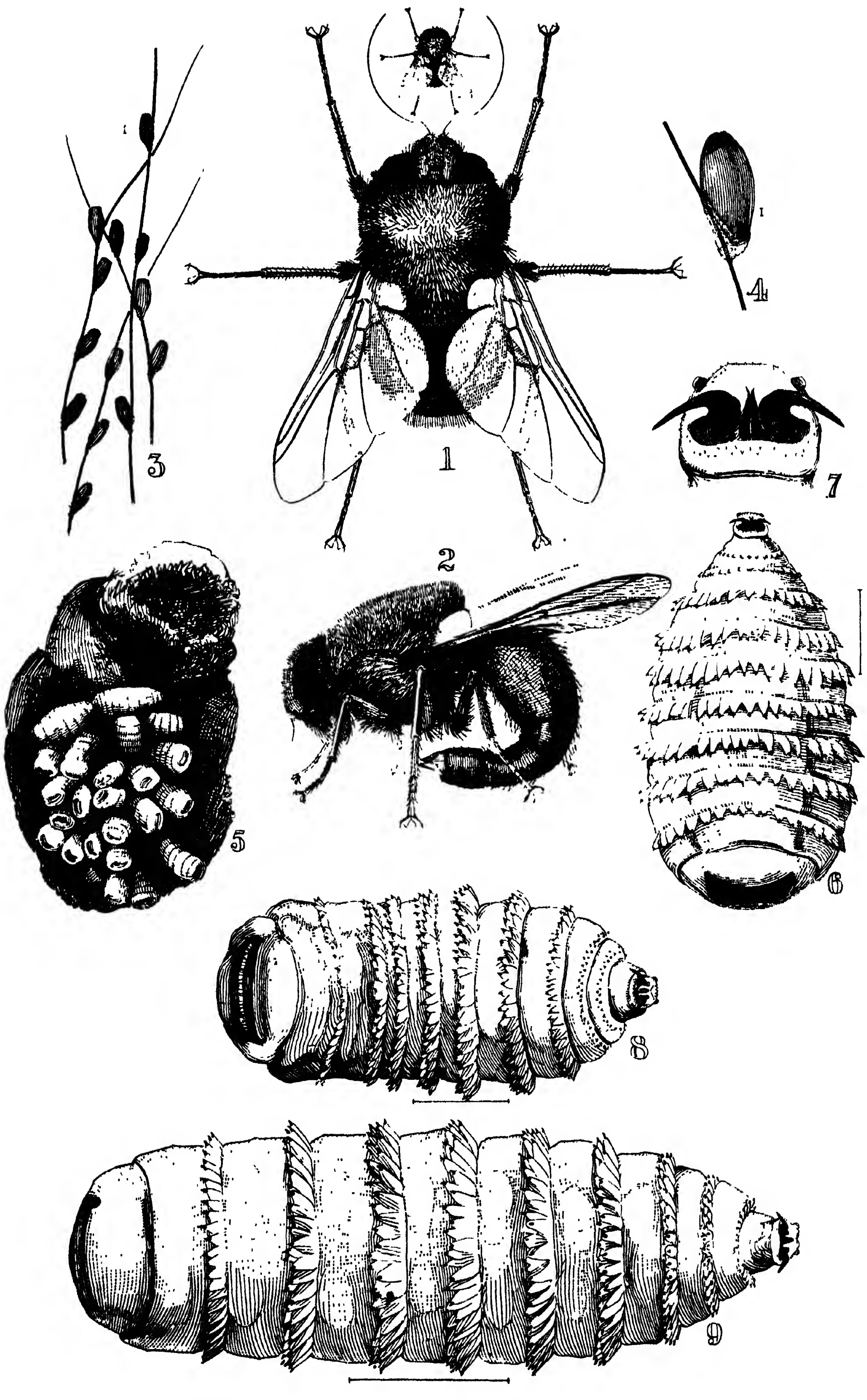
Bots in Mules.

Mr. Thomas Steel, F.C.S., F.L.S., of the Colonial Sugar Refining Company's Nausori Mill, Rewa River, Fiji, has kindly furnished me with the following report of investigations he has carried out, with the view of determining the best means of treating mules infested by bots :—

"One mule was selected and isolated for experiment. On evening of 2nd September a bran mash was given. Next morning, at 7 a.m., 1½ drachm of carbon bisulphide was given in a pint of water, and the dose repeated three hours later ; then at 6 p.m. 1½ pint of linseed oil. The excreta was examined for a period of forty-eight hours. That for the first twenty-four hours, being dry and formed, was spread, in small quantities at a time, on a sheet of tin, and thoroughly and carefully searched ; while that for the latter twenty-four hours, being soft and semi-liquid, was mashed in a double-bottomed sieve and treated as before.

"The results were, for the first period, two thread-worms ; and for the second, hundreds of the same parasite, a few hair-worms, and two pin-worms, but not the slightest trace of bots.

"The physiological action of the drug on the animal was not marked ; the only point noticed was a slight acceleration of pulse. The animal is now at grass, seemingly well."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Note on Preceding Report.

Simultaneously with the receipt of above report from Nausori Mill, we have one from another of our Fiji mills reporting that the bot-flies had commenced attacking the horses. As the bots are supposed to remain for something like a year inside the animals, and the flies emerge in about a couple of weeks after the voiding of the bots, it is highly probable that these flies are from recently-voided bots, and that in Fiji, just at the time of trying the carbon bisulphide treatment, all the bots may have naturally left the mules; hence the negative result at Nausori Mill, as far as bots are concerned. The expulsion of so many parasitic worms would lead us to expect a similar effect on bots when present, and instructions have been given to repeat the carbon bisulphide treatment from time to time during the ensuing year.—T.S.

Conclusion.

Since these notes were written I have examined some specimens of bot-flies in the National Museum collections in Melbourne, which Mr. Kershaw tells me is the common species in Victoria. These flies are named *Gasterophilus salutaris*, and are identical with specimens I have received from Wagga; and only a few days ago Mr. Steel received specimens from the Colonial Sugar Company's estates in Fiji, which also belong to this species. The bots of all these flies also agree in having a double row of spines round the segments, while the larvæ of *Gasterophilus equi* are described as having a single row. Some bots taken from a New Zealand racehorse, killed at Botany, New South Wales, had only the single row, and probably belonged to the latter species. Walker describes four species as found in England, and this one as rare. It differs from the common species in having unclouded wings, and the more brilliant tints upon the head and thorax.

Walker gives the following description:—

Gasterophilus salutaris, (Estr., pl. 1, f. 35, 36 (1815); Long. 4½–5; wings, 9–10 lines. Body black, very pubescent, shining, punctured, brighter and more robust in the male than in the female; head clothed with short ochraceous hair: eyes dull, castaneous; thorax covered with orange down, having at the base of each wing an orange spot, which is more distinct in the male than in the female; wings slightly brown, yellowish-brown at the base and along the fore border; coastal vein brown, the others paler; alulae, opaque-white; abdomen black in the middle, clothed with pale yellow hairs towards the base, and with orange hairs at the tip; legs reddish-brown, clothed with paler down. Not common.

Reference to Plate.

1. Dorsal view of Bot-fly. *Gasterophilus salutaris*, Clk.
2. Side view ,, ,, ,, ,,
3. Eggs of Bot-fly on hair of horse.
4. ,, (enlarged) ,, ,,
5. Larvæ or Bots attached to stomach of horse.
6. Bots of *Gasterophilus salutaris* (mules), Fiji.
7. Head segment of Bot of *G. salutaris* (horses), Sydney.
8. Bots of *Gasterophilus salutaris* (horses), Sydney.
9. Bot of *Gasterophilus equi* (New Zealand racehorse killed in Sydney).

The Weeds of New South Wales

A Tumble-weed (*Amarantus albus*, L.).

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

Description of *A. albus*.

("Tumble-weed," or "White Amaranth.")

An erect, glabrous, pale-green annual herb, about 6 inches to 2 feet high, with slender, ascending, rather whitish branches.

Leaves alternate, from oblong to obovate, from under ½ to 1½ inch long, narrowed into a slender petiole, the top generally with a fine point (the prolongation of the midrib beyond the blade).

Flowers often unisexual, several together in small axillary clusters shorter than the leaves, commonly not longer than the petioles, surrounded by three subulate pungent-pointed spreading bracts.

Sepals, 3, much shorter than the bracts, membranous, whitish.

Stamens, 3.

Petals, none.

Fruit, a wrinkled utricle, opening circumsciss, with a single smooth and shining dark seed.

The leaves fall away in autumn, and on the plains the plant, thus denuded, is freely uprooted and blown before the wind, whence the American popular name "Tumble-weed."

It is stated to be often mistaken in America for the dreaded "Russian Thistle" (a form of *Salsola kali*).

It has largely been diffused in the United States through dirty pasture and lawn grass seeds. It is one of the most pernicious weeds in the United States, and although it does not occur in New South Wales in the same abundance, it is a weed to be dreaded and fought against.

An enemy in Ohio is a white mould, *Cystopus bliti* (Biv.) Lév., which also attacks the beet. It is an annual, and the only way to destroy it is to pull it up before it ripens its seeds.

Common in waste and cultivated lands throughout the greater part of North America.

It is now spread nearly over the whole globe, but is indigenous only in North America, and probably only in tropical North America.

In New South Wales I have only received it from the Riverina, but do not doubt that search will find its invasion to be much more extended than that.

Explanation of Plate.

1. Fruit-bearing branch (much reduced).
1a. Twig (natural size).
2. Part of same enlarged, showing a fruit in axillary clusters supported by bracts.
3. Fruit, a membranous utricle opening circumsciss when ripe.
4. Seed, a single one in each fruit, very dark red (much enlarged and natural size).
5. Leaf much enlarged.

W A GULLICK, GOVERNMENT PRINTER

Wine Making.

Notes on the Fermentation of Must.

M. BLUNNO.

THE agent of fermentation is a microscopic plant of the fungi order, called *Saccharomyces ellipsoideus*, which is usually spoken of as elliptic ferment, on account of its oval-shaped cells; or it is called alcoholic yeast, because of its faculty to change grape-sugar in alcohol.

Alcohol, however, is not the only substance derived from the action of the yeast over the grape-sugar; a large amount of carbonic acid is also formed, which is that pungent, asphyxiating gas that is noticeable in badly-ventilated cellars at wine-making time. Alcohol remains in the wine, carbonic acid is set free, and the bubbling noise is due to that gas, which is released. Some of it still remains in the juice even after fermentation; and it is enough to shake in a glass a little wine a few weeks old to see small bubbles collecting on the surface; but gradually with age, through the racking and fining, all the carbonic acid is driven away. That is rather a pity, because a small proportion of this gas—in such a quantity as not to make the wine over-saturated with it, but leave it quite still—is a good thing, conferring on the wine more vim, while preventing it from growing too old and becoming flat. That is why wines that are too old and flat are in a way rejuvenated by dissolving in it some carbonic acid.

The third substance that is formed in wine through fermentation is glycerine, though in much smaller quantity than the previous ones. Glycerine gives the wine sapidity, smoothness, mellowness. Often the natural harshness of some wine is corrected by the addition of glycerine.

Succinic acid is also formed during fermentation; its quantity, however, is so small that it is quite unimportant to dwell on it here.

The alcoholic yeast is a minute, organised, living body, in the shape of an oval cell. Its germs are scattered in the air, in the soil; they are found on every part of the vine, viz., bark, canes, leaves, and are specially plentiful on the berries and stalk. When grapes are squeezed they get into the grape-juice, and their life begins. They grow and multiply at a terrific rate, and in a few hours from a relatively small number countless millions of other cells are produced, which in their turn originate billions of like cells. A drop of grape-juice in fermentation, looked at under the microscope, shows the field of the instrument literally covered by such cells, free and isolated, or budding without even the smallest interstice to accommodate one single individual Like all living bodies, the life of alcoholic yeast is favoured or obstructed by certain conditions of environment; and the environment in this case is the

* Notes of lecture delivered at Albury, 1908.

chemical composition of the medium in which they have to live and multiply, and the temperature under which they have to labour.

Often wine-makers take a pride in the high proportion of sugar contained in their grapes; but it is a fact that musts containing over, say, 28 per cent. of sugar, ferment with more difficulty than one containing, say, 20 per cent. Grapes when too sweet, are, generally speaking, rather deficient in acids from the wine-making point of view. A certain proportion of acids is not only necessary, but indispensable, to make wine.

The acids found in the grape-juice are malic acid principally, which may be called apple acid, because it is also the main acid in that wholesome fruit; then, in a very small proportion, tartaric acid is found; some musts, in fact, hardly contain any in a free state, but is all combined with potassium, and forms the bitartrate of potassium commercially known as cream of tartar, which is nothing but the wine-stone recrystallised and bleached.

This cream of tartar is found in musts before fermentation in the proportion of 8 to 12 parts per 1,000; but as the alcohol forms it becomes insoluble, therefore precipitates with the lees as soon as the fermentation is finished, and the liquid is quiet and no longer tossed about by the bubbling of the carbonic acid. Consequently in wine we found a much smaller quantity of said substance, about 2 in 1,000 parts of the wine; all the other is in more or less minute crystals, settles down with the sediment, and also lines the inside of the cask, forming that crystalline crust which is colloquially called wine-stone. By the way, popular prejudice looks at that with a kind of horror, and people at the sight of wine-stone conjure up visions of gout, rheumatism, stone in the bladder, in the liver, and what not, and they little know that when they eat grapes, or when they drink the sacrament wine which is supposed not to contain alcohol, or when they drink the wine of the abstemious, that is, the unfermented grape-juice, they take from four to six times more wine-stone than there is in wine. Nay, we all eat scones, but how many know that the nice hot scones contain a good deal of that alleged death-dealing wine-stone, insomuch as baking-powders are made by mixing soda bicarbonate and cream of tartar?

Generally speaking, the higher the proportion of sugar the lower that of the acids in the grapes, except in those that have suffered from a long period of wet weather for five or six weeks prior to the ripening of the grapes; in them sugar, acids and all other substances decrease, while the amount of juice increases through an excess of water.

It is a common thing to hear that one of the faults of Australian wines is that they are too acid, which is another fallacy that originates, like all prejudices, from ignorance of the subject. It will surprise wine makers, therefore, to hear me saying that, on the contrary, Australian wines are deficient in acids. I must explain.

We must distinguish two kinds of acidity—the acidity that is due to fixed acids, or acid salts, which I have already referred to, and that are found in the grapes. They are called fixed acids, because they are not volatile—that is to say, they do not go off if the wine is exposed to the air, or shaken, or put in

a warm room. It is this kind of acidity which is really the grape acids which Australian grapes for wine-making are deficient in.

The other acidity is called volatile acidity, and forms during fermentation and after, in more or less quantity, according to the more or less skilled way in which the grape-juice has been fermented and the wine kept.

This volatile acidity is mainly due to acetic acid, or vinegar acid, and other acids called, in the chemical nomenclature, fatty acids. They are not fixed, but volatile, because if exposed or shaken in the air they volatilise, and their volatilisation is the more rapid the higher the temperature of the environment. The smell of very dilute acetic acid is pungent, not disagreeable, but that of the other fatty acids is pungent and disagreeable at the same time.

The wines made in hot climates are all susceptible to contain a relatively large proportion of such acids compared to what you would find in wines made in cooler climates, all other conditions being equal. Portuguese, Spanish, Southern French, Calabrian, Sicilian, Dalmatian, Algerian wines that have not been taken special care of during and after fermentation, contain a proportion of volatile acidity beyond the degree tolerated by an ordinarily sensitive palate.

The climate of Albury district must be regarded as a hot one during summer, and, while little trouble will be found in growing grapes, extra care must be taken to avoid high temperatures in the cellar and vats, or fermentation will take place too violently.

I have already stated that the alcoholic yeast is an organised and living body, the life of which is much influenced by its environment. Too much sugar is a fault in grapes if you want to make light wine. Light dry wines should not contain more than from 10 to 12 per cent. of absolute alcohol by volume, to obtain which from 17 to 20·2 per cent. of sugar are required. In Albury district you get 25 and 30 per cent. and over. Such musts are specially indicated for making sweet wines of Port and Sherry types, also of Muscats, or for heavy dry wines useful for blending; lighter vintages can, however, supply a Burgundy. Fixed acids are generally deficient, in so far their proportion is from 3·5 to 5 parts of must per 1,000, or a little over. Those musts would be better if they contained from 6 to 8 parts per 1,000.

The operations on musts and wines may be divided in licit and illicit treatments. The correction for the deficiency of acidity by increasing it through the addition of tartaric acid is quite licit, and allowed by the Wine Adulteration Act, 1902, in force in this State. Tartaric acid is a natural ingredient of the grape-juice, and its deficiency may be corrected within the limits of what a suitable degree of acidity should have been. Now, to do so, one should be able to estimate how much fixed acidity the various kinds of grape-juice naturally contain at every vintage. To make such estimation requires a knowledge of chemistry, and the possession of manipulative skill, which is not usually found in vignerons, but I may safely say that, if you increase the acidity of your musts by two parts per thousand, you will keep within safe limits—that is, you may safely add to the must and skins of 1 ton of grapes, 2 lb. 4 oz. of tartaric acid.

All other conditions being equal the yeast works better in a grape juice, say, with 8 parts of grape acids for every 1,000 parts of must than in the same grape juice with only 6 parts per 1,000.

All or nearly all vignerons must be under the impression that in grape picking all unripe and second-crop bunches, which are sour, should be carefully avoided. This is another of those prejudices which I am determined to fight against. The sourness of the second crop of grapes is due to nothing else but to a deficiency of grape sugar and to an excess of acids. Then there you have the most natural corrective of the bulk of your crop, which is too sweet and contains little acidity. When this country will teem with millions, and wine growing will be carried on on every patch that is unsuitable for anything else, and the sides of Mount Kosciusko will be terraced up to 3,000 feet, and planted with vines, then the Government Viticulturist will tell the wine growers of the mountain that they must avoid picking up unripe grapes. But now in the Albury district, I say put them altogether, your wine will be all the better. It is much easier to do this than to make an earlier vintage such as is often advised in hot countries An early vintage would give grapes that are not over ripe, but how can a vigneron decide by simply tasting the grapes, and judge of their acidity, and say whether it is 7, 8, or 9 parts per 1,000? Were he skilled in chemical work, he could take daily samples of grapes and test them, but, even if he could do that, there is nothing so misleading as the tests on samples of grapes, which are made by four or five bunches picked on different points of the vineyard, representing anything but the bulk. Why even the position of the berries on the same bunch will make a difference, and those on the shoulder are usually less acid than those on the point of the bunch. Besides, when grapes are well on the way of ripening, every day makes a great difference; therefore the last to be picked would always be over ripe for wine-making purpose, and in most cases a vigneron would begin picking grapes when they contain, say, 9 parts of acid in 1,000 parts of must, and the grapes picked last would finally contain much less.

Now as to the Temperature.

Fermentation is a complex phenomenon. It is physiological in so far as a live organism, viz., the yeast is concerned, but the yeast exudes a substance called diastase, which acts chemically on the grape sugar and transforms it into alcohol, carbonic acid, &c.,. as above stated. Fermentation, therefore, is a chemical phenomenon as well, and like in all such phenomena there is always loss or production of heat. Fermentation, however, always provides heat; every particle of sugar that is split up in the various bodies already enumerated produces heat. You may easily imagine the amount of heat generated by 5 cwt. of grape sugar which is contained in a ton of grapes with 25 per centum of that ingredient.

If the grapes come in hot, and after being crushed they mark 75° Fahr., you will find that such temperature will steadily rise, and after forty-eight hours or so the liquid will be so hot as to disturb the normal conditions of life of the leaven, that is, of the yeast.

You understand that 5 cwt. of grape sugar that is split into alcohol, carbonic acid, &c., must fatally produce a certain quantity of heat, which is the same, no matter what is the initial temperature at which fermentation begins; whether it begins at 60° Fahr. or at 80° Fahr., the amount of heat produced by 5 cwt. of grape sugar turned into alcohol and the other ingredients is always the same.

However, if the must is cool when beginning to ferment, then the heat produced by fermentation will not cause the temperature in the vat to rise beyond the limits best adapted to the life of the yeast; but if the grape-juice is already fairly hot, then it gets much too hot for the yeast to perform the best work of which it is capable.

What are these limits? They are between 75° to 90° Fahr.; even 92° or 93° Fahr. may be reached without the wine suffering in quality.

There are only two ways to secure that fermentation should take place within the proper temperature limits.

One is to pick the grapes early in the morning, and suspend picking during the hot hours of the day. In this way the juice starts fermenting at a relatively low temperature, and the rising of the initial temperature of the must will not reach or go beyond the limit.

Naturally, gathering the grapes only early in the morning would protract the vintage too long; and if the method may be applied by the wine-grower in a small way of business, the man with large vineyards cannot do it. Then special devices should be adopted, so as to eliminate the increasing heat from the vat.

Readers of the *Gazette* will find a description of several methods of how to control the temperature of the fermenting grape juice in some of my previous articles, viz., "Modern Processes of Vinification," January, 1902; "The Stability of the Colouring Matter in Red Wines," January and February, 1903; "Licit and Improved Treatment of Grape-juice in Wine Making," January, 1906.

Kansas and her Alfalfa (Lucerne).

F. D. COBURN,
Secretary, Kansas Board of Agriculture.

KANSAS is unique in many things, but in none more than in the commanding position she occupies in relation to alfalfa growing. Her development in this industry has been one of the marvels of her prolific agriculture, and with alfalfa, as with winter wheat, no other State is her equal in its area and production. The alfalfa field of Kansas now approximates nearly three-quarters of a million acres, and but three cultivated crops exceed it in annual area, viz.: wheat, corn, and oats. In combination with these, alfalfa furnishes Kansans in abundance with perhaps the best and cheapest rations anywhere available for the maintenance of their live stock, for the excellence of which they are famed.

The credulity of the stranger to alfalfa, however fair-minded, is invariably taxed by a recitation of the truth about this wonderful plant; even the facts cut in two leave him in a perturbed state of doubt as to the veracity of the narrator, but thoroughly convincing are the experiences of those who are actually its growers. It is a perennial blessing to those who are so fortunate as to have an area devoted to its culture; yielding annually, whether the season be wet or dry, its several cuttings of hay unsurpassed in tonnage and quality, it is indeed esteemed as a benefaction, and doubly appreciated in those portions where it flourishes, but where the clovers do not prosper. Another feature, too, that the wide-awake farmer does not overlook or minimise is the improving effects of its roots, restoring and enriching, rather than depleting, the fertility of the soil in which they grow, to the great benefit of other succeeding crops. As is well known, alfalfa is one of the oldest forage plants, but to the husbandry of the American farmer it is of but recent acquisition. Kansans were among the foremost to correctly estimate its worth, and its widespread introduction in the Sunflower State has been one of the most important factors in increasing bank deposits and the *per capita* wealth.

The increase in its area in Kansas affords some, although no adequate idea of the growing appreciation in which the plant is held. It is sixteen years since the crop was first thought of enough importance to chronicle its statistics, when the enumerators of the Board of Agriculture returned the area for the State as 34,384 acres. This year (1907) the area in alfalfa is 742,140 acres, or an increase of 20·7 per cent. over the area of 1906, 132 per cent. more than in 1901, and a gain of 2,058 per cent. over the area of 1891. Alfalfa can be grown in every county in the State, and 103 of the 105 counties report greater or less areas devoted to it in 1907. Of the 103, ninety-two counties show increases aggregating 130,369 acres, while eleven report decreases aggregating 3,542 acres, making a net gain for the year of 127,327 acres. Jewell, a central county

bordering Nebraska, has nearly 49,000 acres in alfalfa, by far the largest acreage of any one county; Smith, its neighbour on the west, ranks second with 30,939 acres; and Butler, south and east of these, comes third with 30,355 acres. Other counties having over 20,000 acres each are Cloud, Mitchell, Phillips, Republic, all north-central counties, and Sedgwick, adjoining Butler. The largest gains in area in the year are likewise reported by Jewell and Smith, of 7,027 and 6,258 acres respectively, followed by Mitchell with an increase of 5,451 acres, Washington with 4,991 acres, Wabaunsee 4,988 acres, Sedgwick 4,613 acres, and Republic 4,029 acres.

Kansas, situated as she is, bordering the Missouri River on the east and extending 400 miles westward toward the Rocky Mountains, presents a wide variety in soils and other conditions, but alfalfa is all the way successfully grown, thus demonstrating its general adaptability. The farmers of practically all portions are annually sowing enlarged areas, as is indicated by the county statistics. For example, of the more western counties, Wichita and Stevens, in the second tier from Colorado, report gains in area in the past year of 576 per cent. and 633 per cent. respectively; Clark has increased its area 112 per cent., Pratt 104 per cent., Stafford 142 per cent., and Rush 95 per cent.; of the eastern counties may be mentioned Leavenworth, on the Missouri River, which enlarged its area 158 per cent. in the past year; Johnson gained 178 per cent., Bourbon 241 per cent.; over 100 per cent. was gained in Brown, and 98 per cent. in Jackson.

In 1891 there were nine counties having 1,000 or more acres; this year there are eighty-one. In 1891 there was one county, Finney, having over 5,000 acres; now there are forty-four such counties, twenty-nine of which have 10,000 acres and upwards.

In Kansas, alfalfa growing was a prelude to prosperity, and is the steadfast promotor of her progress. From comparative obscurity it has steadily risen to the foremost rank of the hay plants, and has already resulted in quadrupling the State's output of tame hay. In 1890 the value of the tame-hay crop was 2,000,000 dollars, while that of 1905 was worth over 10,500,000 dollars. The annual value of products of live stock in that time has been practically doubled, and alfalfa has made of Kansas, if not first, one of the foremost States in dairying—a most desirable branch of husbandry that, intelligently and generally followed, well-nigh ensures continued and enlarged prosperity. Alfalfa, it seems, supplied the one requisite Providence failed to provide in establishing the otherwise ready-made conditions for dairying in Kansas, and the attention being given this mode of intensive farming in nearly every locality is having its beneficial influence, commercially and socially.

As a hay, there is none so good for all kinds of live stock as alfalfa, and for horses and hogs it is a most invaluable food, either as a hay, a soiling-crop, or as pasture. As a meat-maker, milk-maker, and money-maker, it is equally prized, and as a renovator and improver of soils it has no competitor.

How to Utilise the Surplus Orange Crop.

M. BLUNNO.

THERE are no certain data as to how many oranges are required to obtain 100 gallons of juice. It is evident that it depends on the size of fruit, thickness of the peel, on the variety, on the season, and on the pressure exercised in squeezing the fruit. The vessels and utensils required are—One vat in which to ferment the juice, about 150 gallons capacity; two casks of 100 gallons capacity each (one cask is filled with the orange wine, the other is a spare one, in which the wine is racked, so that it is exchanged from one vessel into another at certain periods); a few demijohns and jars; a small hand-press.

To make 100 gallons of orange wine, an equal quantity of orange juice is obtained from as many fruit as required; to this 300 lb. of cane sugar are added; the whole is well stirred until the sugar is completely dissolved. The following ingredients are also added, and well mixed, viz.:—

6 oz. of ammonia phosphate (at 3s. per lb.).
1 oz. of common salt.
1 lb. of cream of tartar (1s. per lb.).
10 lb. fresh wine lees, or 8 oz. beer yeast.

Mix everything thoroughly in the juice, throw a sheet or a blanket over the vat, which should be placed in a cool room in a corner out of the reach of the sun.

It is important that the juice be extracted from the fruit as rapidly as possible. The oranges are split in halves, and quickly squeezed; a small press, all of wood—without iron fittings—would help very much, but care should be taken not to exercise a very strong pressure.

Fermentation will gradually set in, and when this is completed and the juice is quite still, it is racked off and stored in one of the casks, leaving an ullage of 5 or 6 gallons, which are put in demijohns. An hydraulic bung is put in the bunghole, so as to allow the escape of any residual carbonic acid. When the water in the hydraulic bung has ceased from bubbling, the ullage is filled and the cask bunged tight.

The cost of making 100 gallons of orange wine will amount to about £10, including labour. Naturally, the outlay is not included in this estimate, and the outlay would be about £20 for the purchase of vat, casks, a small press, &c. A great saving might be effected by purchasing second-hand vessels—good clean casks that have served to store wine, brandy, whisky, sherry, or port can be safely used.

The orange wine so made is an intoxicant, and a person would not be authorised to sell it without first obtaining a license.

Pickling Citrus Fruit.

The pickling of citrus fruit peels, or of the citrus fruit themselves, to be afterwards used to prepare candies, is carried out as follows:—

The pickle used is salt and water, viz., a solution of 12½ lb. of salt in every 10 gallons of water. One of the heads of a cask of about 100 gallons is removed and the vessel is filled with peels, or with the citrus fruit split in halves. The pickle is poured on them until the vessel is full to the brim, then the head that was removed is put back. The cask will gradually get in ullage, through evaporation, therefore more brine is added through the bung, so as to keep the cask always quite full.

In this condition they will keep for a long time, and can be even shipped to distant countries.

African Wonder Grass (*Panicum spectabile*).

B. HARRISON, Tweed River.

This is the heaviest-yielding grass in Australia, and it appears to thrive well in any soil or situation. So far, it has proved a very shy seed bearer, but it is readily propagated by pieces of the procumbent stem, which roots freely at each joint. When well established it forms a mass of the richest green foliage, about 5 or 6 feet high, gradually lowering to the outer border, where a network of shoots or runners cover the ground; it roots at the joints, and sends up then a mass of the softest and most luscious fodder. It is of rather coarse growth, but should prove unrivalled for pasture or ensilage. It is generally spoken of in the highest terms of praise by all those who have grown it, on account of its great vigour and astonishing growth. A writer in the West Australian *Journal of Agriculture* says:—"As the result of numerous experiments, the African Wonder grass has proved the best of all the grasses yet introduced to this State; it has succeeded in almost every place where it has been tried, both in dry and moist situations, and the introduction of this grass for the stock-owners of this State is worth several times over all the money that has been spent for grass seeds and experimenting with grasses during the last few years." At the Bathurst Experimental Farm this grass has proved a vigorous grower, is unaffected by frosts, and sheep like it well. At several of the West Australian experimental farms it has given the most promising results; in fact, it seems to stand the dry weather better than any grass that we have yet had growing. It appears to be doing equally well in sandy and clayey land, and also in dry places. This grass grows most luxuriantly, and, as well as the upright growth, it sends out long lateral stems, which form fresh roots at the nodules and cause the grass to spread quickly. Farmers in the western district should give it a trial, as it is a splendid drought-resisting grass, and would enable them to double and treble the stock-carrying capacity of their holdings.

Hawkesbury Agricultural College and Experimental Farm.

Silo in a Hill-side: How to Construct.

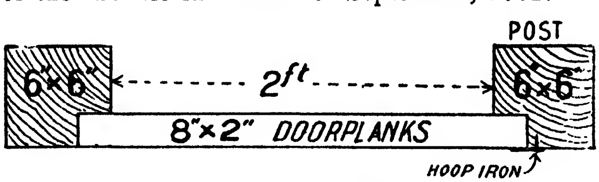
There are many situations where a silo can be constructed in a hill-side, thus doing away with the necessity for an elevator, the material for the silage being carted to the top and there chaffed and allowed to fall into the silo. Questions are frequently asked regarding such silos; therefore, the following information, supplied by Mr. A. Brooks, Works Foreman, Hawkesbury Agricultural College, will be of general interest:—

The style of silo which could be constructed in the side of a hill is a combination of the pit and overground patterns—that is to say, the hill may be cut into sufficiently far back to give the vertical depth required at the face, and this may be increased by sinking down 4 or 5 feet, or even more if the ground is hard, and will not require draining round the site of the silo.

A road may be constructed to the top, where the chaff-cutter may be placed, when no elevator will be required; but the question of applying the driving power may prevent this being done.

At least part, if not the whole, of the walls will require to be timber-lined. This may be done with logs for cross-rails, and slabs for vertical lining, jointed together as closely as possible.

The front frame will require to be strongly made of corner-posts, door-posts, and rails. At each side of the doorway the slabs should be fixed vertically, but those in the door-frame, which are movable, may be horizontal (see sketch), or they may be arranged as shown in the diagrams of the tub silo in *Gazette* of September, 1902.



As shown on the sketch, the door-posts are checked out the thickness of the planks, and on one side a strip of hoop-iron is nailed on. This prevents the loose planks falling into the silo, when empty.

To make the walls air-tight, it will be necessary to cover the inside face with P. and B. paper, not less than 2-ply thick, which requires to be tacked on to the slabbing, as the filling proceeds. It can be purchased for about 21s. per roll, containing 1,000 square feet.

If white ants are troublesome, the timbers must be treated with a liberal coating of some of the preserving oils, or else line the silo with brick and cement.

The roof may be a flat one, pitched as the slope of the hill or less, and, if covered with iron, a sheet can be removed each time the silo is filled.

With regard to the fall or grade of the hill, a 1 in 1 grade would be a good position.

METEOROLOGICAL BUREAU, NO. 4 DIVISION, NEW SOUTH WALES.

Weather Conditions during January, 1908.

S. WILSON,
Divisional Officer.

AT the beginning of the month the rear isobars of a high pressure were located over New South Wales, Victoria, and the main portion of Queensland, with its centre covering the eastern districts of New South Wales. This distribution persisted until the 9th, when it began to move towards the north-east. Its stagnation over the Eastern States resulted in a heat wave in South Australia and Victoria, which gradually affected parts of our Western districts, as it was permitted to move eastward by the displacement of the anticyclone. The highest temperatures reported on the 10th were—111 degrees at Bourke, 108 at Brewarrina, 106 at Carinda and Mogil, and 105 at White Cliffs.

The rainfall during the week ended the 7th was light to moderate and patchy, but the passage of a low pressure over our State between the 8th and 11th was attended by some good general falls. The greatest amounts during that period were—In Western Division, 200 points at Hungerford and 166 at Nymagee; North-western Plain, 237 at Pilliga; Central Western Plain, 103 at Carinda; Riverina, 50 points at Deniliquin; North-western Slope, 122 at Bingara; Central-western Slope, 346 at Dubbo; South-west Slope, 69 at Marsdens; Northern Tablelands, 309 at Armidale; Southern Tablelands, 374 at Bombala; North Coast, 235 at Byron Bay; Hunter and Manning, 70 at Port Stephens; Metropolitan, 190 at Kurrajong; South Coast, 127 at Pambula.

Light to moderate rain continued in the extreme north-east corner until the 16th, but otherwise fine weather ruled over the State generally.

High temperatures again occurred: Euston registering 117 degrees on the 17th; Deniliquin and Balranald, each 115; Wentworth, 114; Hay, 111; and Urana and Wagga, each 110 degrees. Hot weather conditions prevailed more or less generally until the 20th, when they were displaced by a cool southerly change. An extensive anticyclone controlled the weather of the southern half of the continent on the 21st, and fine weather was experienced over the greater portion of that area; but at 9 a.m. on the 22nd, monsoonal conditions appeared over the Eastern States and caused rainfall of rather patchy character, associated with thunder, over Central and Eastern districts of our State on the 23rd and 24th. The distribution was as follows:—In the Western Division, from 1 point at Bourke to 135 at Euabalong; North-

western Plain, Walgett 5 points only; Central-western Plain, from 5 points at Warren to 78 at Ungarie; Riverina, from 1 point at Carrathool to 43 at Hillston; North-western Slope, 46 at Warialda and 15 at Bingara oniy; Central-western Slope, from 16 points at Wellington to 62 at Parkes, South-western Slope, from 3 at Albury and Gundagai to 218 at Marsdens, Northern Tablelands, Bundarra 128 and Inverell 16 points; Central Table lands, from 3 at Springwood to 33 at Rockley; Southern Tablelands, from 3 at Goulburn to 303 points at Kiandra; North Coast, from 4 at Tweed Heads to 23 at Nambucca Heads; Hunter and Manning, from 2 points at Taree and Raymond Terrace to 41 at Port Macquarie; Metropolitan area, Kurrajong and Sydney, 10 points only; South Coast, from 1 point at Picton to 35 at Eden.

On the 25th the isobaric chart showed the whole of Australia under very weak barometric control, the isobar of 30 inches occupying the greater part of the mainland and forming a monsoonal dip over New South Wales; but by the 27th a great change had taken place, for over the south-western portion of the continent a "high" of some energy had appeared, while the rear of another was situated over Eastern Queensland and New South Wales. Between these two anticyclones a long, narrow trough of low pressure had developed, extending from Tasmania to Alice Springs, in Central Australia. These conditions resulted in some good rainfalls over various divisions of the State, the Central Tableland, Hunter and Manning, and portions of the South Coast faring best. The heaviest falls were as follows:—271 points at Lawson, 200 at Jerry's Plains, 199 at Picton, 170 at Sutton Forest, 157 at Bowral, 146 at Carcoar, 111 at Taralga, 106 at Camden, and 102 at Newcastle.

At 9 a m. on the 28th very little change in the pressure distribution was remarked, although the several systems had travelled slightly eastward. An incipient low pressure, however, covered the northern part of Australia. As the result of the above-mentioned conditions, rain of a partial character—in some cases associated with thunder—was received over parts of the Hunter, Northern and Central Highlands, and Central-western Plains. During the ensuing twenty four hours a curious development had occurred over Northern and Eastern Australia. The low pressure had passed completely off the mainland to the Tasman Sea, but the "high" which was off our North Coast experienced a slight retrogressive movement, and a monsoonal tongue of low pressure had formed over the western portion of New South Wales, with its centre in the northern part of the continent. The centre of the anticyclone to the south showed little or no easterly progress, but its advance isobars had extended as far as Gabo Island and Tasmania.

That portion of the pressure distribution which was over our State caused some very high temperatures in the Western Districts; in fact, the highest registered during the present summer. Brewarrina reported 119 degrees; Bourke, 118; Carinda, 114; and Mogil, 1.0 degrees.

Rainfall, associated with thunderstorms, was also reported from many districts, the various subdivisions of the State being all more or less represented, with the exception of the North Coast. Some heavy falls were

registered in the Metropolitan area, Central Tableland, and North-western Slope; the heaviest, however, occurred round about the Metropolis. Turramurra had 388 points; Mount Colah, 333 points; and Sydney, 121 points. At Rockley, on the Central Tableland, 116 points were recorded; at Scone, in the Hunter and Manning, 160 points; and at Nundle, on the North-western Slope, 135 points. The remaining amounts ranged from a few points to 97 points.

During the 28th and 29th, monsoonal conditions developed and intensified over the eastern half of the continent, resulting in light to heavy rainfall over the north-eastern districts of New South Wales, with the exception of the extreme North Coast. Over Western Divisions, also, a large reduction in temperatures occurred, and a prevalence of cloudy, thundery conditions was shown over the greater part of the State.

For the week ended Friday, the 31st, the rainfall over our State was as follows:—

Western Division	from	2	points at	Ivanhoe	to	130	at Tilpa
North-western Plain	,,	4	,,	Boggabilla	,,	106	,, Wee Waa
Central-western Plain	,,	8	,,	Quambone	,,	75	,, Condobolin
Riverina	,,	2	,,	Corowa	,,	82	,, Coolamon
North-western Slope	,,	11	,,	Manilla	,,	135	,, Nundle
Central-western Slope	,,	5	,,	Gilgandra	,,	206	,, Coolah
South-western Slope	,,	3	,,	Junee	,,	82	,, Tumbarumba
Northern Tableland	,,	4	,,	Walcha	,,	104	,, Tenterfield & Armidale
Central Tableland	,,	35	,,	Orange	,,	452	,, Lawson
Southern Tableland	,,	3	,,	Bungendore	,,	140	,, Cooma
North Coast	,,	3	,,	Tweed Heads	,,	136	,, Nambucca
Hunter and Manning	,,	2	,,	Port Macquarie	,,	265	,, Jerry's Plains
Metropolitan	,,	40	,,	Parramatta	,,	201	,, Kurrajong
South Coast	,,	8	,,	Moruya Heads	,,	238	,, Sutton Forest

The following statement also shows the percentage distribution of rainfall over the various subdivisions of New South Wales for the month of January, 1908:—

Division.		Percentages Above normal.		Below normal.
Over North Coast ...	from ...	—	...	44 to 75
,, Hunter and Manning	,, ...	—	.	14 to 96
,, Metropolitan	,, ...	—	...	32 to 78
,, South Coast	,, ..	—	..	14 to 89
,, Northern Tableland	,, ...	13	to	81
,, Central Tableland	,, ...	19	,,	63
,, Southern Tableland	,, ...	99	,,	91
,, North-western Slopes	,, ...	—	...	31 to 80
,, Central-western Slopes	,, ...	134	to	72
,, South-western Slopes	,, ...	51	,,	96
,, North-western Plain	,, ..	25	,,	86
,, Central-western Plain	,, . .	—	...	48 to 91
,, Riverina	,, ...	—	...	44 to 100
,, Western Division	,, ...	15	to	100

Reviewing the State as a whole, the conditions during January, 1908, were moderately dry. Excepting at a few widely-scattered places, the rainfall

generally was below the average, more especially over the Western Division and Riverina, where for the most part the totals were very small, and at several stations no rainfall was recorded. In many districts the best falls occurred during the last week of the month, particularly in the Western Division, Riverina, and over the Eastern Division.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of January, 1908:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	Inches.	Degrees.	
India...	+ ·02	- 0·3	Normal.
Sydney (N.S.W.) ...	+ ·17	+ 2·3	Moderately dry.
Melbourne (Victoria)	+ ·09	+ 7·9	Very hot and dry.
Perth (W.A.) ...	+ ·08	- 3·6	Below normal.
Adelaide (S.A.) ..	+ ·06	+ 7·3	Dry till end of month ; then wet.

Judging from the above table, the pressure in India and Australia during the month was above average. At Sydney the mean, which was seventeen-hundredths above normal, constitutes a record for Sydney during January.

Excepting at India and Perth, where temperatures were lower than normal by 0·3 and 3·6 degrees respectively, some great excesses are shown, especially in Adelaide and Melbourne, where it was 7·3 and 7·9 respectively above the average.

Dry weather prevailed generally over Australia, but India reports normal conditions.

The Needlewood (*Hakea leucoptera*).

This is a tall shrub or small tree, found in western New South Wales, and from the wood of the root-stock the well-known Needlewood tobacco pipes are made.

For many years attempts have been made to place the making of these pipes on a firm basis as an Australian industry, but these have failed, partly because the wood has sweated, and partly because it has been difficult to secure a regular supply of the article.

Messrs. Field and Villars, of "The Australian Calabash Pipe Factory," 192, Pitt-street, Sydney, are entering seriously into the utilisation of Needlewood, and ask to be put into communication with people who will supply the seasoned wood.—J.H.M.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

DURING the present month is the most seasonable period of the year to plant the fodder and renovating crops—rape, tares, and peas. The bountiful rains which fell early in February have made the planting of these crops quite possible, even in our drier districts, and on land previously unfallowed. With the object of obtaining increased returns from future wheat crops, it is to be hoped that this welcome and opportune fall will result in a larger area than usual being planted.

Because of the bounty offered by the Federal Government, to encourage the growth of linseed (grain) and flax (fibre), wheat-growers in suitable districts are probably considering the advisability of planting some of their land with this crop. Flax or linseed is a possible profitable rotation crop in many of our wheat districts. If, as stated in the daily Press, there is now a market for unretted flax straw, the possibilities with this crop are largely increased, and farmers ought to determine its suitability for their conditions by growing a small area. It can be planted and cultivated with the usual machinery found on a wheat farm, and the resulting crop, if necessary, can be stripped without much difficulty and without much loss of grain, though the usual plan is to harvest it with the reaper and binder, and thresh it with a special flax thresher. Early sowing, about April, of 30 to 40 lb. of seed per acre is likely to give best results.

Growers who intend to give this crop a trial are advised to treat the seed before sowing with a solution of formalin, 1 lb. to 45 gallons of water, in order to prevent the introduction of a destructive fungus disease known as "flax wilt," which attacks the plants in all stages of growth, and causes them to wilt and die off. This disease of the flax plant is generally introduced on to the farm by sowing infected seed. Seeing that flax is a new crop on most farms, the disease is not likely to be present on them; it therefore is advisable to take special precautions to prevent its introduction. Prof. Bolley found that this disease was the cause of "flax sick" soils.

Applications will now be received from farmers wishing to try new varieties of wheats, and to compare them with those they have hitherto found most profitable. Sufficient seed to plant up to half an acre of each of four varieties will be supplied to approved applicants who are willing to conduct the trial in accordance with the plan supplied by the Department, and who undertake to furnish the results of the trial on its completion. The varieties in the experiment are to be planted with the same machinery and in the same way that the main crops of the farm are planted, for the object of

these experiments is to determine whether the new wheats produced by the Department are equal or superior to the old ones, from a farmer's standpoint—that is, when judged by their ability to yield well. From other standpoints, including those of the miller and baker, each of the new wheats, before being made available for distribution, has been proved to be superior in one or more respects to those already in cultivation.

The varieties available for trial are—Bobs, Bunyip, Cleveland, Comeback, Federation, Firbank, Florence, Genoa, John Brown, Jonathan, Jumbuck, Rymer, Tarragon, and Thew. Of these, Florence, Genoa, Firbank, and Thew have not been available for farmers before this season. Florence and Genoa have, in our trial plots, shown themselves, under severe trial, to be practically smut-proof, and, in consequence, seed of them does not require to be bluestoned or treated with any other fungicide for the prevention of smut. Firbank is a very early wheat, chiefly valuable for hay; the object aimed at, when breeding it, being to produce a wheat as valuable for hay as the well-known Berthoud or Zealand—which is one of its parents, but much earlier. Thew is also an early wheat, and, because of its promising behaviour as a resister of rust at the Hawkesbury Agricultural College, is likely to prove valuable, particularly for hay, in districts liable to rust.

The other wheats are more or less known to our farmers, and many of them can now be regarded as standard varieties in some districts.

A farmer may select any four of these for trial, or he may leave the selection of some, or all of them, to the officers of the Department, after stating what varieties he has tried and which of them in the past have proved most suitable for his conditions.

To each experimenter a field-book, in which to record planting and other details, general directions as to the conduct of experiments, and specific instructions as to the carrying out of the particular experiment undertaken, are forwarded with the seed. These particulars are as follows:—

Farmers' Experiments.

General Directions.

The ground chosen for the experiments should be typical of the land under cultivation on the farm, and should be as uniform as it is possible to get it.

A very suitable place for most experiments—other things being equal—is near the centre of a paddock which, during the present season, is being planted with similar crops to those experimented with. Owing to the likely depredations of rabbits, birds, &c., it is not advisable to have the experiments near any of the boundaries of the paddock, and for obvious reasons it is necessary to have the plots removed from the influences likely to be exercised by growing trees, buildings, &c.

Unless specially directed otherwise, the whole of the plots should be ploughed and prepared in a uniform and in a similar manner to the remainder of the paddock in which they are situated. Thus their preparation can take place at the same time and in the same manner as the remainder of the paddock.

After the preparation has been completed, and just before the planting is to be done, will in most cases be found the best time for definitely marking out the plots.

The plots may vary in shape, but are preferably rectangular, and the results from them will be more reliable and less affected by inequalities in the soil if the plots are long and narrow rather than square or nearly square.

Whilst plots which are only as wide as the drill (half-round) will be more satisfactory and will furnish more reliable results than a wider plot, yet when all the circumstances

surrounding a farmer's experiment are considered, the width which will give the most all-round satisfaction will be twice the width of the drill, *i.e.*, a width requiring one round of the drill to plant it.

The following table gives the dimensions of quarter-acre plots and half-acre plots, with the different size drills on the market :—

Size of Drill.		Dimensions of ¼-acre plots.				Dimensions of ½-acre plots.			
Number of tubes	Distance apart.	Width.	Length.	Width.	Length.	Width.	Length.	Width.	Length.
	in.		ch. yd.		ch. yd.		ch. yd.		ch. yd.
12	7	½ round..	23 12½	1 round...	11 17¼	½ round...	47 3	1 round..	23 12½
12	8	½ ,, ...	20 13¾	1 ,, ..	10 7	½ ,, ..	41 5½	1 ,, ..	20 13¾
13	7	½ ,, ...	21 16½	1 ,, ...	10 19¼	½ ,, ..	43 11	1 ,, ...	21 16½
13	8	½ ,, .	19 0¾	1 ,, ..	9 11½	½ ,, ...	38 0½	1 ,, ...	19 0¾
14	7	½ ,, ..	20 4½	1 ,, ..	10 2¼	½ ,, ..	40 9	1 ,, ...	20 4½
14	8	½ ,, .	17 15	1 ,, ..	8 18½	½ ,, ..	35 8	1 ,, ..	17 15
15	7	½ ,, ...	18 18¾	1 ,, ..	9 9¼	½ ,, ..	37 15½	1 ,, ..	18 18¾
20	7	½ ,, ..	14 3	1 ,, ...	7 1½	¼ ,, ..	28 6	1 ,, ...	14 3

It is desirable and convenient to plant longer plots than is required by the area determined upon. If longer plots be planted, any excess at the ends can be removed before the produce of the plots required for comparison is harvested.

Having decided upon the dimensions of the plots, they should be marked out by placing firm stout pegs at the corners. These pegs should be numbered as required.

For convenience of harvesting, either with a reaper and binder or with a stripper, it is necessary to leave spaces or divisions between the plots. These divisions should be at least 6 feet, and are preferably 9 feet wide. Where the drill is used, such spaces or divisions can be conveniently made by running the drill empty for one width after planting one plot and before commencing to plant the next plot.

Before commencing to plant the experiment, see that the machine is in gear, and that the seed and fertiliser will be distributed at and from the boundary of the plot.

EXPERIMENT No. 1.

A Trial of Five Varieties of Wheat.

In this trial five varieties of wheat are to be grown under the same conditions and compared with each other. One of the varieties is to be the one which has been chosen and which is being used by the experimenter for his main crop The seed of the other four varieties will be supplied by the Department.

This experiment will require at least five plots. More valuable and reliable results will, however, be obtained if seven plots are used as per Plan 1. Of the three plans submitted, the experimenter is to choose the one most suitable for his conditions.

With the exception of the check plots, which will be planted with the variety used by the experimenter for his main crop, a different variety is to be planted in each plot. All the varieties are to be planted in the same way, at the same rate, at the same uniform depth, and on the same day.

Plant the varieties in accordance with the arrangement shown on the plan selected.

The variety	will be distinguished by the letter			**A**
,,	,,	,,	,, ...	**B**
,,	,,	,,	,, ...	**C**
,,	,,	,,	,, ...	**D**

ALTERNATIVE PLANS. **Experiment No. 1.**

(1) *Best Plan.*

1	CHECK PLOT.	MAIN CROP VARIETY.
2		NEW VARIETY A.
3		,, ,, B.
4	CHECK PLOT.	MAIN CROP VARIETY.
5		NEW VARIETY C.
6		,, ,, D.
7	CHECK PLOT.	MAIN CROP VARIETY.

(2) *Not such a good plan as* (1) *but better than* (3).

1	CHECK PLOT.	MAIN CROP VARIETY.
		NEW VARIETY A.
3		,, ,, B.
4		,, ,, C.
5		,, ,, D.
6	CHECK PLOT.	MAIN CROP VARIETY.

(3)

1		NEW VARIETY A.
2		,, ,, B.
3	CHECK PLOT.	MAIN CROP VARIETY.
4		NEW VARIETY C.
5		,, ,, D.

The method of conducting the trials has been made as simple as possible, and experience in the past has shown that farmers who have undertaken these trials have had no difficulty in planting these experiments as planned.

During the present month farmers in some districts will commence planting their wheat crops. This early planting should be confined to the late varieties, or to such crops as are intended to be fed off in the winter. Unless required for this latter purpose, early varieties such as Bunyip, Federation, and Comeback should not be planted during the present month, as when sown so early they are likely to come into ear at an unseasonable time either to produce grain or to be made into hay. The thorough preparation of the soil should, however, be pushed on in readiness for planting next month or in May. In the matter of preparing the soil, it pays to be *thorough*, for plants are unable to make use of either the fertility or moisture stored up in clods. The result of observation goes to show that it is better to delay planting rather than to sow on poorly-prepared soil. A hopeful sign for the future of the wheat industry is that the day of the slipshod farmer is passing.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE.

Summary for January, 1908.

Air Pressure (Barometer.)			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 15 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	% of year's Evaporation.
29·91 28th.	30·32 1st.	30·14	51·4 2nd.	106·4 28th.	75·66	73·77	40 11th.	98 30th.	61	·380 21st.	7·770	6·073	16

Rainfall...											
Points	14	17	1	1½	8	2	2	13	31	19½	=109 points.
Dates	8	9	11	24	25	26	28	29	30	31	

Mean for 16 years = 275 points.

Wind ...	N	NE	E	SE	S	W	NW
	4	23	11	5	6	2	2

Thunderstorms, 7th, 8th, 9th, 24th, 28th, 29th.

Greatest daily range of temperature, 49·5° on 17th.

Days temperature rose above 95°	95·3°	105·5°	99·1°	101·7°	104·7°	97·5°	106·4°
	9	17	19	20	21	27	28

W. MERVYN CARNE,
Observer.

Export of Oranges, 1907.

W. J. ALLEN.

In July the Minister approved of our sending a few cases of oranges and lemons to London, Vancouver, and Seattle, in order to again test the carrying quality of our fruit, and the prices to be obtained in the different markets; as also to ascertain whether or not they would land in good condition, and if there would be any difficulty about landing our clean fruit at any of these ports.

It may be claimed by some that we did not send large shipments, but our reason for going slowly was to find out, 1st, whether our fruit would carry well; 2nd, whether there would be any difficulty in landing it; 3rd, the price it would command; and, 4th, the total cost of landing and selling fruit per case.

The varieties under test were (to London)—

Washington Navels.	Blood.
Valencia Late.	Joppa.
Mediterranean Sweets.	Lisbon Lemons.

(To Vancouver)—

Mediterranean Sweets.	Lisbon Lemons.
Valencia Late.	

(To Seattle)—

Valencia Late Oranges.	Lisbon Lemons.

Sizes of Oranges and Lemons.—A few of the Valencia Lates were $2\frac{3}{4}$ inches in diameter, but the majority of the oranges were 3 inches, while the Washington Navels went $3\frac{1}{4}$ inches in diameter. Most of the lemons were $2\frac{1}{4}$ inches in diameter, but a few cases measured $2\frac{1}{2}$ inches.

The fruit was all evenly graded, wrapped and packed in bushel cases having centre divisions. These cases hold about two-thirds as much as the American cases, and the Vancouver Agent reported that the fruit would have sold better if we had put it up in the standard sized Canadian case. The Seattle Agent made no complaint about the case, but if large consignments were sent, I do not doubt but that they would prefer having them packed in their standard-sized cases. In nearly every case they complain that our shipment was a little late. My reason for shipping late was to try and put the Valencia Late orange in the different markets in as ripe a condition as possible, as this variety is rather sour when it first colours, and requires to hang for a while before it is at all sweet. However, there would be no trouble in sending citrus fruits from here so that they would land in either London or America at the time when they would be found most acceptable for the trade. In looking over the different items of cost, it will be seen that outside

of the Customs duty at Seattle, the other expenses are excessively high, and unless these can be materially reduced, they could never expect to do business with us. On the other hand, the Vancouver charges are moderate, and the prospects for doing business there should be very good as there is a big back-country market among miners, timber-getters, and the many resorts in the mountains visited during the summer months by thousands of tourists.

The oranges and lemons were sent as deck cargo and not in the cool chambers as was the case with the London shipment. Had the prospects of next year's crop been a normal one I would have liked to have seen our growers again sending some of their best fruit, but owing to the very dry spring and summer which we have experienced, I fear we will not have sufficient fruit to supply our own requirements.

In reference to the report of the Agent-General on the condition of our fruit on arrival, it will be noticed that he claims that it was soft, while the previous year's shipment arrived in better condition. This I consider was due to the wrapping paper we used. This year we used the ordinary glazed, while last year we used a waxed paper. The latter is a little more expensive, but the fruit wrapped in it usually keeps in better condition than that wrapped in ordinary wrapping paper.

VANCOUVER.

	s. d.	s. d.
Oranges realised per case ...		12 3
Expenses per case:—		
Cartage in Sydney ...	0 1	
Steamer freight, Sydney to Vancouver...	1 8	
Landing charges, Vancouver ...	0 1	
Customs entry, Vancouver ...	0 2	
Commission on sale (5 per cent.) ...	0 8	
		2 8
		9 7
Lemons realised per case ...		14 3
Expenses (same as oranges) ...		2 8
		11 7

SEATTLE.

	s. d.	s. d.
Oranges realised per case ...		12 3
Expenses per case:—		
Cartage in Sydney ...	0 1	
Steamer freight to Seattle ...	1 11	
Freight and cartage ...	0 11	
Customs brokerage services:—		
Effecting release ...	0 8	
Duty ...	1 9	
Brokerage, 10 per cent. ...	1 2	
		6 6
		5 9
Lemons realised per case ...		10 3
Expenses (same as oranges) ...		6 6
		3 9

London Shipment.

			s.	d.
Oranges realised per case ...			14	9½
Expenses per case:—	s.	d.		
Cartage in Sydney ...	0	1		
Freight to London ...	2	9		
			2	10
London:—	s.	d.		
Sale room charges ...	0	7		
Packages on show ...	0	2		
Brokerage and guarantee ...	0	3		
			1	0
			3	10
			10	11½
Lemons realised per case ...			12	0
Expenses (same as above) ...			3	10
			8	2

Extract from letter from Agent-General to the Hon. the Minister for Mines and Agriculture.

London, 18 October, 1907.

* * * * *

The fruit, although arriving rather soft, which suggested slight over-ripeness, sold exceedingly well; the Navels, indeed, fetching over 3d. each. The excellent colour and appearance of the fruit was a great attraction to the fruit buyers in the West End shops who were specially invited to attend the sale. Oranges and lemons are also scarce in this market at the present time. I will report fully next mail.

Agent-General to Minister for Mines and Agriculture, Sydney.

Sir, London, 25 October, 1907.

With further reference to the citrus fruits from the Pera Bore orchard, which arrived *ex* s.s. "India," I have the honour to forward herewith the account sales for the same, from which it will be seen that the net proceeds amount to £16 10s. 9d.

Messrs. Keeling and Hunt advise me that the prices obtained must be considered high, but apart from the good quality of the oranges, it happened that there was very little of any kind of showy fruit on the market at the time. These clean-looking, bright, and well-coloured oranges were particularly welcome.

With regard to quality of the consignment, it was excellent, though as regards condition the fruit was soft and more or less over-ripe.

The "Late Valencias" had the finest skin, the 96's were what they call "large 420" size, and this size is the best of all.

The "Navels" were very fine, but the "Mediterranean Sweets" were of a rougher quality. The method of packing was good, but might have been tighter, and it is well to put the oranges exactly over each other, and all lying the same way. If the box is not quite full a little wood-wool is good to prevent rattling.

The lemons were small and soft, of good quality; but there is very little room for them except during September and October, as they receive so many from Sicily, Majori, Sorrento, and Malaga, practically all the year round.

Messrs. Keeling and Hunt took a great deal of trouble with this fruit, and after finding it had arrived in such excellent show condition, sent special notices to well-known fruiterers regarding it. They advise me that there is an excellent market for Australian oranges during September and October, but after this time heavy supplies come from other places and prices fall.

J. Fyfe Smith, Vancouver, to Director of Agriculture, Sydney.

Dear Sir, Vancouver, B.C., 5 October, 1907.

I beg to report that the twelve cases of citrus fruits shipped by your Department to Vancouver in my care, arrived in verv good condition. I disposed of same to a retail merchant as per enclosed account.

Both lemons and oranges were clean and considered very good samples by the wholesalers in Vancouver. Of the thirteen cases for Seattle one was delivered in a damaged condition. I held this back as it would have been pillaged in transit. I distributed the oranges amongst the wholesale houses to give them an idea of what New South Wales is capable of exporting.

Tho fruit would have realised higher prices if it had not been too late in the season, and if it had been packed in Canadian standard cases. This is a matter of vital importance in this and the American markets.

Hamitt Bros. to Director of Agriculture.

Dear Sir, Seattle, Washington, 7 October, 1907.

Replying to your favour of August 30 we are pleased to advise you that the shipment of oranges and lemons arrived in Seattle on the 5th. We received instead of nine cases of oranges and four of lemons, eight cases of oranges and four of lemons. Mr. J. Fyfe Smith, in whose care these goods were shipped, having held one box at Vancouver, on account of its being damaged more or less in transit.

On the oranges and lemons we received we wish to congratulate you on the quality, more especially the oranges, which were very high coloured and in practically perfect condition. The lemons were cured down, we think, a little too much; otherwise they were very good.

We sold these oranges and lemons as per account sales enclosed, and are attaching draft to these account sales. which, we hope, you will find all in order.

We are sorry you did not make us a larger shipment, as we could have used it to very good advantage at the time these goods arrived; in fact, from the latter part of September to the first of November there is an opening for some of these goods every year, and another season we will take this matter up with you early, and we hope to be able to do some business with you.

Under separate head, in a day or two, we will take up the matter of packing these goods, &c., with you. As we will receive new Navels on this market about the 1st to the 10th of November this always stops the sale of Valencia oranges.

The oranges you sent us were a very desirable size for this market. At your convenience we would like to hear from you as to how you ordinarily pack your oranges. You possibly have seen some of our Californian cases. The size you sent us was about equivalent to what we call 150 or 176 size.

We would also like to have you advise us if the sale of these oranges was entirely satisfactory, and meets with your approval.

Orchard Notes.

W. J. ALLEN.

MARCH.

THE most important work to be carried out this month is the harvesting of fruit, preparing the land to receive cover crops, attending to pests, and the preparation of land which is to be planted this coming winter, as also the ordering of the necessary trees.

For those who are exporting apples, the earlier in the month the fruit can be sent to London the better are the chances of its bringing good prices. as when the season is normal to early, the early and medium markets are usually better than the late ones, as it happens at times that some of the earlier summer fruits clash with the late shipments of apples, and it is therefore well for exporters of apples to bear this in mind.

See that all fruit is well graded as to colour and size, and packed neatly and closely in nice, new, clean cases; the latter to be neatly branded before they leave the packing house with the name of the variety, the grade—that is whether they are selected, specially selected, or choice; but never put first, second, or third grade, as the quality of all grades should be equally good—the only difference being in the size and colour.

Some varieties of fruit when picked under-ripe will, during certain seasons, develop black spots, on the voyage, similar in appearance to the bitter pit. It is therefore best to see that such varieties are not picked until they are ripe, in which case the fruit is not so liable to become so marked.

During the beginning of February splendid soaking rains fell all over the coastal area, which up to that time had suffered from a prolonged drought, and many of the older citrus trees were languishing. The splendid rains have caused most of the trees to freshen up, and the fruit is fast filling out. Notwithstanding the dry weather experienced, there are some very fine apples and pears in many of those orchards which have received good attention, and where the trees are not very old. These fruits, when placed on the market, are bringing very high prices.

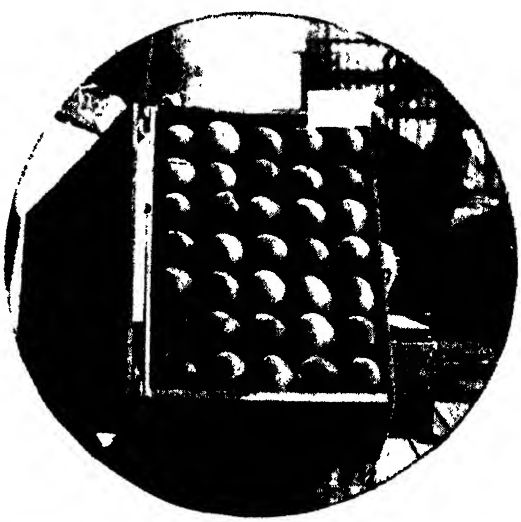
Where it is the intention of the orchardist to sow cover crops this fall among the trees or vines, it will be well to have the land prepared and the crop put in by the end of this month. Grey field peas, black tares, and rye may be sown, the last-named variety being the quickest-growing crop. Last season's experience taught us to put this crop in early in the fall, and get it ploughed under early in the spring, while the land has sufficient moisture left in it to plough well.

Fruit Fly, wherever prevalent, must receive unremitting attention. It is well to place tins containing kerosene around the trees which are carrying fruit, in order to trap as many flies as possible.

Codling Moth.—Continue to examine the bandages on all trees in orchards carrying fruit, and for a few days after the fruit is picked; occasional grubs

will be found. Our Inspectors under the Fruit Diseases Act have found parasites at work in a good many places, but not in sufficient numbers to keep the moth under. The bandages should be at least 1 foot wide, tied round the trunk of the tree with a cord or fastened with a copper nail. The cord should be placed about the middle of the bandage, the upper half of which should be turned down to form a retreat for the grubs.

Peaches.—In the April, 1897, number of the *Agricultural Gazette*, pages 267 and 268, I advised growers to plant certain varieties of peaches, among which was the Elberta. At that time growers considered this variety rather coarse, and, in consequence it was not planted very extensively for several years, but of late they are beginning to change their minds, and to-day it is one of the varieties which is being most largely planted. Messrs. Jenkin Bros., of Lisarow, had a very well-packed case of this variety, which took first prize at the Gosford Show this year. There are several other good varieties ripening at different times, but there is no better all-round peach. It is a beautiful dessert fruit, and makes splendid canned and dried fruit, as well as a rich jam.



Messrs. Jenkins Brothers' first prize case of Elberta Peaches

Block kindly lent by the *Town and Country Journal.*

Planting.—Wherever there is sufficient moisture the latter part of this month is a good time to plant out young strawberry plants.

Where young orchards are to be planted the land should be put in condition as soon as possible, so that it may be in readiness to receive the trees by June, which is one of the best months for the planting of deciduous trees.

Powdery Mildew belongs to the Erysiphea group, and its *mycelium* spreads itself over the surface of the attacked organ, and resembles the oïdium of the vine, which also belongs to the same group. On this account, sulphur dusted on the plants in fine powder, which has been found so effective against oïdium, is equally effective against powdery mildew.

The ammonio-carbonate of copper spray is also recommended for this disease and late stages of fungus disease generally. The directions for making the solution are as follow :—

Formula :—Copper Carbonate	5 oz.
Ammonia (Liquor Ammoniæ sp. gr. ·880)	3 pints.
Water	45 gallons.

Make a paste in a wooden bucket of the carbonate of copper and a little water. Add the ammonia, which will dissolve the paste, and then dilute to 45 gallons.

The first application should be made long before the leaves are half grown.

Copper carbonate is obtainable from wholesale chemists, but is not stocked in very large quantities, as there is little demand for it. The price is 1s. 9d. per lb., in 7 lb. lots.

Owing to the difficulty of obtaining carbonate of copper in smaller towns, as well as the high price usually charged for it, the Department recommends that the fruitgrowers prepare it.

The following is the method given by Pierce:—

"In a barrel dissolve 6 lb. of copper sulphate in 4 gallons of hot water. In another wooden vessel dissolve 7 lb. of washing soda or sal-soda, in 2 gallons of hot water. The soda should be clear (translucent), and not white and powdery, as it appears when air slaked. When cold pour the soda solution slowly into the copper solution. As soon as bubbles cease to rise fill the barrel with water, stir thoroughly, and allow the mixture to stand over night to settle. The next day syphon off all the clear liquid from the top with a piece of hose, fill the barrel with water, stir thoroughly, and allow it to stand a second night. Syphon off the clear liquid the second day, fill the barrel with water, stir, and syphon off the clear liquid once more the third day. Now pour out the wet sediment from the barrel into a crock or other earthen dish, strain out the excess of water through a cloth, and dry slowly in an oven, stirring occasionally, if necessary, to prevent overheating. Prepared in this manner there should be obtained, if none of the sediment in the barrel be lost, about 2·65 lb. of copper carbonate."

The cost of preparing carbonate of copper by this method will depend on the cost of the sulphate of copper and the sodium carbonate (sal-soda or washing soda). The present price of copper sulphate is 3d. per lb., and washing soda 2d. per lb.; thus the cost will be as follows:—

	s.	d.
6 lb. of Copper Sulphate, @ 3d.	1	6
7 lb. of Sodium Carbonate @ 2d.	1	2
	2	8

As these ingredients will make 2·65 lb. of the carbonate of copper, the cost will be approximately 1s. per lb.

The advantages of making it at the orchard are twofold; firstly, the sulphate is obtainable almost anywhere, thus saving delay, and secondly, the cost is less.

Very little time is taken up, as there is no continuous stirring or watching as is the case with some mixtures.

Farm Notes.

HAWKESBURY DISTRICT—MARCH.

H. W. POTTS.

As a result of continuous drought the doleful recital of constant crop failures month after month has been an unpleasant duty in the past. Happily this is now entirely changed. The monsoonal rains of February reached the Hawkesbury Valley and brought a copious downfall of 6 inches, all of which was readily absorbed. The parched soils and subsoils were saturated. Insufficient rain fell to fill the lagoons and waterholes which have dried out. The volume and character of the rainfall has not been equalled for the past ten years. The entire aspect of the valley has changed from a drought-stricken condition to one of rapid growth, with intensely green grass and rapidly-growing crops on all sides. Where farmers took the risk in January and planted maizes, sorghums, and millets, the results now are most gratifying. The growth is phenomenal. There will be green forage crops for stock in April, May, June, and July, with a surplus for conservation as ensilage.

There has been no period during the past ten years during which farmers have found more need for energetic and constant work. Urgent provision is essential for early supplies of green feed. The activities of the farm have reached and necessitate this most intense application.

The soils are in excellent condition for cultivation—friable, moist, and warm. The long continuous period of drought with enforced fallows have released ample plant food. The conditions for sturdy, prolific, and rapid growth could not be more favourable. Stock are provided for until winter by the excellent and abundant grazing conditions.

The milk yields at the dairy have responded already to these.

Provision must be made this month to get in the earliest cereal crops and also prepare the land for the main sowings next month.

Crops for Green Feed.—For early crops for green feed the Macaroni or Durum wheats are worthy of attention, and may be sown in the middle of this month in order to get the first cut for green feed in August, and secure a second crop for hay or grain. These wheats are hardy, withstand drought, and resist rust, and in our experience have amply demonstrated their special value for this district, more particularly where the soils are light and somewhat poor. The plant grows tall, has smooth, broad, succulent leaves, and affords useful forage in the early stages.

Farrer's Durum and Medeah give the best results.

Again, oats and peas (the grey field pea) form a useful combination for forage, $1\frac{1}{2}$ bushels of oats to $\frac{1}{2}$ bushel of peas drilled in, or oats and tares in similar proportion. Where a stimulating manure is required, the application of 1 cwt. per acre of bonedust, dried blood, and superphosphate, equal parts, will be found sufficient. It has, however, to be remembered that where crops failed last season through absence of moisture, the artificial fertilisers applied then were not used, and probably are lying dormant ready to be taken up with the favourable moisture conditions existing now, hence judgment must be exercised in determining the necessity for adding fertilisers this season, and the quantity to apply.

For soiling purposes, Skinless barley is in high favour with dairy farmers. The soil requires careful cultivation for the crop. A manure similar to that suggested for the oats will answer in this case, with $1\frac{1}{2}$ bushels of seed per acre drilled.

Where an area of poor land is available, it might be profitably utilised by growing a crop of Emerald rye for green feed. Sow $1\frac{1}{2}$ bushels to the acre. This plant is very hardy, and whilst not so nutritious as the abovementioned crops, yet it often comes in handy, and repays well for its growing.

Hay.—The early hay crops of wheat might be sown this season towards the end of March, seeing the conditions are suitable for the late maturing varieties, such as Blount's Lambrigg, White Lammas, and White Tuscan. It has been shown that these usually are fit to cut in September. The best class of oat to sow so early as this month is that known as the Potato Oat. The straw is clean, stout, rather short, with good flag, and is highly esteemed for early green feed. Sow 2 bushels to the acre.

Hungarian Millet.—The final crop of this useful green fodder may be sown this month. It requires a rich mellow soil. The growth is heavy, and apart from its value as green fodder, it has proved one of the most valuable and easily handled crops for conversion into ensilage.

The late crop sown last year at the College proved a veritable gold-mine during the past summer for our cows in the form of stack ensilage, and was relished and greedily consumed.

Rape.—Much has been written about rape of late years, and it is satisfactory to note that generally a greater area is being grown. It supplies a rich, palatable, and succulent food for all classes of stock, including poultry, and more particularly sheep. With the latter the dual advantage is gained by the rich class of manuring the land is given. The feeding value of rape necessarily depends on the character of the soil, but given good land the results closely approximate to that of clover. Rape is sturdy and vigorous in growth, and occupies the position of a catch or cover crop. It is particularly serviceable in acting as a cleansing crop. A good growth is assured in from eight to twelve weeks. It may afford several successive cuttings, and will give from 10 to 15 tons of feed to the acre.

A fine, moist, clean seed-bed should be made, and seed of the Dwarf Essex variety sown in drills 2 feet apart at the rate of 4 lb. per acre. A broadcasted crop will require more seed.

Turnips, Swedes, Kohl Rabi, Tree Kale, and Thousand-headed Kale may be sown as early as possible. Deep rich loams give the best returns. Anderson's Imperial Purple-top Swedes gave us splendid returns in the past. A quickly-growing favourite green crop with a moist soil is the White Mustard. This can be sown at the rate of 4 or 5 lb. seed to the acre. It provides excellent fodder for sheep.

Maize.—The late-planted crops are now above ground and are growing well. It is important that they be subjected to shallow cultivation to keep down the summer grass and weeds, as well as to aerate the soil. Constant attention to this will keep up rapid and sturdy growth.

Sorghums.—These crops, like the maize, require equal attention in the form of shallow cultivation.

Lucerne.—The past three seasons of drought have given us unmistakable proof of the hardy nature of lucerne and its extraordinary power as a drought resister. On our poor high lands no grass or fodder plant responded more vigorously to the recent falls of rain. During the summer a small picking of this richly-nourishing plant was always available, from a grazing point of view, notwithstanding the absence of moisture. The more we see of this plant under the adverse conditions we recently experienced, the more satisfied we are of its great capacity for providing an ideal food for stock. The opportunity now offers to increase the area under this useful crop. It naturally thrives best on deep loamy, rich soils, with good natural drainage. This, however, should not discourage farmers testing it on poor soils. It is surprising the growth noted on low-class soils, always providing there be depth and good natural drainage. In all cases the land should be prepared by thorough cultivation and subsoiling. The addition of ½ ton gypsum per acre is always attended with good results. A clean, fine seed-bed, particularly when prepared after fallow, is advantageous, and favours early development of the plant.

When lime is not added, the addition of 2 to 2½ cwt. per acre of superphosphate and sulphate of potash may be harrowed in, in the proportion of four of the former to one of the latter.

Use from 12 to 20 lb. seed per acre, and adopt every precaution to secure clean seed, free from dodder. It may be sown in drills or broadcast.

GLEN INNES DISTRICT—MARCH.

R. H. GENNYS.

Green fodders.—Barleys may be sown this month for green fodder for the winter. Cape and Skinless barley are both good in this connection; the latter stools badly, so seed should be sown thickly. Ryes may also be sown for green fodder or for grazing in winter. White Rye and Emerald are two good varieties. For grazing on, Thousandfold stools well and stands much longer before coming into head than the other varieties mentioned. Wheat and oats may also be sown for green winter feed; the former is the sweeter, but oats grow the quicker and form a good fodder for milking cows.

Swedes and other turnips may now be sown with advantage.

Lucerne may be sown towards the end of the month on deeply-ploughed, well-prepared land. See that seed is good, bright, and yellow, and guaranteed free from dodder. Cover lightly with very light harrows, with tines slanted backwards towards the driver, or with a bush harrow.

Red Clover.—This is a capital fodder plant for New England; it might also be sown towards the end of this month. Planted with any of the grasses in the proportion of two-thirds grass seed to one-third clover will be found about right. It is better to sow the light seed of grasses first, sowing the clover afterwards, as a more even distribution will thus be made. Small grass seed and clovers should, like lucerne, be only covered lightly. Clovers, besides improving the pasture, conserve much nitrogen on their roots, providing nourishment for the grasses they are sown with.

Rape may be sown on good, well-prepared land. A dressing of 56 lb. of superphosphate to the acre almost doubled the yield of fodder in our experiments last season. The practice here is to first mix the rape seed with the manure with shovels as evenly as possible, then sow through the manure feeders of the drill only, the seed-feeders not being used.

Kale, Cabbages, Cauliflowers, Onions, Lettuces, Carrots, Celery may also be sown.

Orchard.—Destroy all fallen fruit by boiling or burning, examine bandages on the apple, pear, and quince trees about once a week for codling moth. The chrysalises of the moth which find shelter in the folds of the bandages should be killed by cutting in half with a knife, or the whole bandage dropped into boiling water, care being exercised not to drop any in the process.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

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[2 Plates.]

Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 188.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVII—*continued.*

Conifers.

X.

Sub-tribe 2.—*Lariceæ.*

15. Larix, Salisbury. "*The Larch.*"

This is a genus of alpine or sub-alpine trees confined to the northern hemisphere. Larches do not do well in New South Wales, merely existing in a few places. At the same time they cannot be said to have been thoroughly tested, say in such places as Southern Monaro.

16. Pseudolarix, Gordon.

Laricopsis of Veitch's Manual. It is proposed to supersede *Pseudolarix* for purely literary reasons. "Nature produces nothing false," certainly not in the Greek sense of *pseudos.* Admitted that the name is not a model one, but if botanical nomenclature were to be disturbed on such grounds it would be much more unstable than it is.

(1). *P. Kaempferi,* Gordon. "Chinese or Golden Larch."

A tall tree, native of China, inflorescence umbellate. Deciduous.

It just exists in the Sydney Botanic Gardens (M 18). It should be well tried in the coldest districts, for it is a beautiful tree.

17. Cedrus, Loudon.

A genus of stately trees known as Cedar in Britain.

There are three easily distinguishable forms, conventionally recognised as species but scarcely so in a strictly scientific sense, respectively known as the Cedar of Lebanon, the Deodar or Indian Cedar, and the African or Mount Atlas Cedar.

The typical form which inhabits the slopes of Mount Lebanon and the Cilician Taurus, has been known as *The Cedar* from remote antiquity; the existence of a second Cedar forming extensive forests in the north-west Himalaya was not known to science till the commencement of the nineteenth century; whilst the presence of a third on the Atlas Mountains of Algeria was not suspected till the discovery after the occupation of the country by the French in 1831.—(Veitch's Manual, p. 406.)

The geographical distribution of the Cedars is remarkable; they are confined to three separate regions in the great mountain systems that cross the eastern continent between the 28th and 38th parallels of north latitude with but little interruption from the Atlantic Ocean to the China Sea (*op. cit.*).

Cedrus Deodara, Loudon.
Botanic Gardens, Sydney.

(1.) *C. atlantica*, Manetti. "Mount Atlas Cedar."

North Africa. A stately tree attaining a height of 100 feet. For park and landscape considered the best of the three in Great Britain. It has been grown in the Sydney Botanic Gardens for years (*e.g.* M 19), but in our climate it is too close in appearance of the Deodar to be separately planted. In colder districts it would flourish better and display its characteristics.

(2.) *C. Deodara*, Loudon. The "Deodar" or "Indian Cedar."

A noble tree, native of the mountains of Afghanistan, Baluchistan, and north-west Himalaya. This is the *Cedrus* most generally useful in New South Wales as an avenue or specimen tree.

For an excellent account of it see "The Deodar: a Sylvicultural Sketch" (*Indian Forester*, xxv, 4).

We have many specimens in the Sydney Botanic Gardens (M 19; L 32 b, 35, 15 b, 29 c).

(3.) *C. Libani*, Loud. The "Cedar of Lebanon."

Native of the Syrian mountains, Cilicia, and Cyprus.

A majestic tree of medium size.

This is the celebrated tree with sacred historic associations. It is hardy in Britain, where there are trees over 2¼ centuries old.

C. Libani is even more difficult to grow in Sydney than *C. atlantica*. It can only be recommended for the coldest districts.

Sub-tribe 3. *Sapineæ*.

18. Picea, Link. The "Spruce Firs."

This is a genus of evergreen trees of conical or pyramidal outline. It is a fairly natural one, and includes about 17 species, though some may be varieties of better-known forms. Most of them find New South Wales too warm.

The most important botanical characters by which *Picea* is distinguished from *Abies* are:—The leaves are stomatiferous on the upper surface; the dehiscence of the anthers is longitudinal (not transverse); the scales of the cone are always longer than the bract, and persist after the dispersion of the seeds. Very obvious differences are also observable in the pendulous (not erect) cones with differently shaped scales; in the four-angled spines-tipped leaves of the greater number, and in the general habit of most of the species.—(Veitch's Manual, p. 423.)

(1.) *P. orientalis*, Carrière. "Eastern or Oriental Spruce."

A medium sized or tall tree, found on the south-eastern shores of the Black Sea, thence to the Caucasus. It is a beautiful species, but not much is known concerning it. It will, doubtless, flourish in many parts of New South Wales.

Our Sydney experience is that it is very slow in growth here, and it should be tried in colder localities.

M 19 (Sydney Botanic Gardens).

(2.) *P. polita*, Carrière. "Prickly Fir."

A tall or medium sized species from Japan, with stout, pungent leaves. It is rather tender in England, and should be well tried in New South Wales.

(3.) *P. Smithiana*, Boiss. (*P. Morinda*, Link.) "Himalayan or Indian Spruce."

A large tree in its native mountains, occurring throughout "the temperate Himalaya from Bhotan to Afghanistan, with a vertical range of from 6,000 to 11,000 feet elevation, and occasionally higher."—(Veitch's Manual, p. 455.)

A beautiful species most suitable of all the *Piceas,* so far as we know, for Sydney conditions, but even it finds our dry spells very trying.

M 19 ; L 6, 7 c (Sydney Botanic Gardens).

19. Tsuga. The "Hemlock Firs."

These are readily distinguished from all other Abietineæ by their habit and foliage, especially by their slender, often drooping, terminal shoots clothed with leaves having a special anatomical structure.

They are tall evergreen trees.

(1.) *T. Albertiana,* Kent. "Western Hemlock" of the United States and Canada. Sargent, t. 605.

A stately, tall tree, the largest of the genus. North California is its most southern limit, so that seeds would require to be collected from as warm a locality as possible in order to ensure success in New South Wales.

(2.) *T. Brunoniana,* Carrière. "Himalayan Hemlock Spruce."

A beautiful tree of medium size, for the most part tender in England. It should therefore be quite hardy in sheltered situations in our coast range.

(3.) *T. Caroliniana,* Engelmann. "Carolina Hemlock Spruce." Sargent, t. 604.

This species, originally found in Carolina, also occurs in southern Virginia and northern Georgia. It is a recent introduction into Great Britain as is stated "has thus far proved hardy in the neighbourhood of London." It will probably be found useful in many parts of eastern New South Wales.

(4.) *T. Sieboldii,* Carrière. "Japanese Hemlock Fir."

A medium-sized tree much cultivated in Japan.

> *T. Sieboldii* takes the place of *T. diversifolia* south of Nikko, ascending in places to a considerable elevation, nowhere forming a continuous forest, but scattered in groves among deciduous trees or mixed with *Pinus densiflora.*—(Veitch's Manual, p. 473.)

It is, therefore, more likely to succeed in New South Wales than *T diversifolia,* the other Japanese species, which forms a great forest, covering the Nikko Mountains at an elevation of more than 5,000 feet.

20. Pseudotsuga.*

An anomalous genus presenting affinities to *Abies* and *Tsuga* and less closely to *Picea.* Kent, in Veitch's Manual, proposes to provisionally place *Keteleeria* with it.

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* Kent, in Veitch's Manual (2nd edition, p. 474), proposes to reject the above name (substituting *Abietia*) for the following reason :—An uncouth, barbarous name, half Greek, half Japanese, "utterly bad in construction," and misleading in such meaning as it has, and which I have refused to adopt as a protest against the admission of such names into scientific nomenclature. Also, in compliance with Art. 60, sect. 4, of the Laws of Botanical Nomenclature, adopted at the International Botanical Congress, held at Paris, in 1867, which enacts that—Everyone is bound to reject a name which is formed by a combination of two languages.

The Vienna Congress does not make this a valid reason, and the supercession of names for such reasons is dangerous.

(1.) *P. Douglasii*, Carr. "The Douglas Fir" or "Red Fir." Sargent, t. 607.

The foregoing outline of the distribution of the Douglas Fir brings out prominently the following remarkable facts:—It is the most widely distributed, not only of all American Firs, but of all American trees. It is spread over 32 degrees of latitude, a meridional range greater than that of any other coniferous tree, excepting, perhaps, the common Juniper; it must thence possess a constitution that "enables it to endure the fierce gales and long winters of the north and the nearly perpetual sunshine of the Mexican Cordilleras; to thrive in the rain and fog which sweep almost continuously along the Pacific coast range, and on the arid mountain slopes of the interior, where for months every year rain never falls."* The Douglas Fir is not only one of the most interesting, but it is also one of the most valuable of trees; its size, its capacity of adapting itself to new surroundings and the excellence of its timber, all contribute to make it one of the most important inhabitants of the forests of Western America. It attains its greatest development in the humid lowlands of Western Washington and Oregon, especially around Puget Sound and on the western slopes of the Sierra Nevada, where the precipitation from the Pacific Ocean is greatest; in these regions it often attains a height of 300 feet, with a trunk 9 to 12 feet in diameter.†—(Veitch's Manual, p. 480.)

Surely a tree like this is worthy of acclimatisation in New South Wales, but care should be taken to select seed from a locality with climatic conditions approximately similar to those obtaining in the locality in which it is proposed to grow it. Some forms (*e.g.*, var. *taxifolia*) are recommended for planting sand dunes near the sea.

20a. Keteleeria.

An anomalous genus close to *Pseudotsuga*.

(1.) *K. Fortunei*, Carr. (*Abies jezoensis*, Lindl.)

A large tree resembling the Cedar of Lebanon in habit and aspect. It does fairly well in the Sydney district, and will certainly do better in cooler localities. The best tree in the Botanic Gardens is in that lawn nearest to the Federal Government House Grounds.

M 25 (Sydney Botanic Gardens).

21. Abies, Link. The "Silver Firs."

A noble genus of trees, specially ornamental in their young state. They are best suited for the colder districts of this State.

(1.) *A. amabilis*, Forbes. "California Fir."

This might be well tried.

(2.) *A. balsamea*, Miller (*Picea balsamea*, Loudon). "Balm of Gilead Fir." "Balsam Fir." Sargent, t. 610. Also Bentley and Trimen's "Medicinal Plants."

This tree yields Canada Balsam, used for optical purposes.

Native from Newfoundland to Virginia. It is for the most part a swamp tree; "it seems to need a constant supply of water at the roots, as many die in exceptionally dry seasons."

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* Silva of North America, xii, p. 91.

† The British public have had for many years past an opportunity of forming an idea of the stupendous dimensions attained by this tree. In the Royal Gardens at Kew is erected a flagstaff brought from Vancouver Island; it consists of a single piece 159 feet in length, 22 inches in diameter at the base, tapering to 8 inches at the summit; it weighs 3 tons and contains 157 cubic feet of timber. The tree from which this flagstaff was made was 250 years old, as indicated by its concentric rings.

Keteleeria Fortunei, Carr.
Botanic Gardens, Sydney.

It is chiefly interesting because of its well known oleo-resin, and should therefore be tried in cold regions with moist soil. It just exists in Sydney.

M 18 (Sydney Botanic Gardens).

(3.) *A. bracteata*, Nutt. The "Bristle-coned Fir." Sargent, tt. 615, 616; also *Bot. Mag.* t. 4740.

Remarkable for its long, leaf-like bracts plentiful between the scales.

Abies bracteata is the most remarkable of all the Silver Firs. Its strict but stately habit, its massive deep-green foliage, its singular cones, and especially its extremely restricted habitat, have invested it with an especial interest both for botanists and for horticulturists. Its only known habitat is on the outer western ridge of the Santa Lucia Mountains in South California, where at the present time "it grows only in a few isolated groves scattered along the moist bottoms of cañons, usually at elevations of about 3,000 feet above sea-level."—(Veitch's Manual, p. 497.)

It should be hardy in the cooler parts of New South Wales.

(4.) *A. cephalonica*, Loudon. "Mount Enos Fir." "Greek Fir."

A stately, medium-sized tree, growing in Greece at elevations ranging from 2,500 to 5,000 feet.

It is hardy over the greater part of Great Britain, and steps should be taken to thoroughly test it in the colder parts of New South Wales.

(5.) *A. cilicica*, Carr. "Cilician Fir."

This inhabits the mountain system of Asia Minor, known under the general name of Taurus. It has a vertical range of 4,000 to 6,500 feet. Veitch's Manual states:—

The precise limits of its distribution have not yet been ascertained; these limits may, however, be assumed to be nearly conterminous with those of the Cedar of Lebanon, with which it is associated wherever met with.

That being so, this Silver Fir should flourish in many parts of New South Wales.

(6.) *A. concolor*, Lindl., and Gordon. (*Picea concolor*, Gordon.) "American White Fir." "California Silver Fir."

This Fir has an extensive range west of the Rocky Mountains. It is common on most of the mountain ranges of California, between 3,500 and 8,000 feet, and therefore it may be expected to succeed in our coldest mountain regions. It is a specially handsome species.

(7.) *A. firma*, Sieb and Zucc. "Japanese Silver Fir."

The largest and handsomest of the Japanese species. It is found in the warmest parts of Japan and Corea. It does only fairly well in the Botanic Gardens, Sydney.

In Japan this tree is called "Uro-Siro," signifying that the leaves are white beneath, and also "Sjura-Momi," meaning White or Silver Fir.

(8.) *A. Nordmanniana*, Spach. "Nordmann's Silver Fir." *Bot. Mag.* t. 6992.

A beautiful species from the Trans-Caucasian region, well known in some of our mountain regions, but not as frequently planted as its great merits demand.

It does fairly well in the Sydney Botanic Gardens. In Mount Wilson, for example, it is one of the loveliest trees imaginable.

M 19 (Sydney Botanic Gardens).

(9.) *A. religiosa*, Schlecht. "Sacred Fir," because branches are used for decoration of churches. *Bot. Mag.* t. 6753.

Native of Mexico, and often at a considerable elevation. It is the most southern species of the genus, is tender in England, and would probably succeed in many parts of New South Wales.

About Geese.

G. BRADSHAW.

Chapter I.

Historical.

Within the past few months there have been numerous applications to the Editor for "Something on Geese."

The latest information on the subject was from the pen of Mr. J. McCue, a former poultry expert at the Hawkesbury College, and appeared in the November *Gazette* of 1900,--that issue and its reprints being long since exhausted.

The following monologue should supply everything practical on the subject to inquirers.

When the goose became domesticated is still a matter of contention, nor does it matter for the purpose of this paper, except to say that some writers consider it more ancient than the common hen, both of which have been servants of man from early times. Ancient literature has told us that since the fourth century the goose has provided the quills wherewith all our history has been written, and depicted to us the virtues, faults, customs, and foibles of our ancestors.

It was kept about the house in the time of Homer, and this poet never mentioned t hen. Fattened fowls, certainly, are mentioned in I Kings, 5-23; but some writers assert that these were geese, as they abounded throughout Palestine. Herodotus (450 B.C.), the "father of history," speaks of the Egyptian priests being supplied with abundance of beef and geese.

When the goose first arrived in England is also lost in the vista of centuries. That they were there at a very early time there are many records.

The rent for land tenure in olden times was usually paid in kind,--geese being invariably included in the lists of landlord's requests. Geese were usually required at Michaelmas, ducks and hens at other quarter days. It is thought that the English custom of feasting on fatted goose on St. Michael's day originated from the payment at that period of such kind.

In the reign of Edward IV, we read that John de la Hay was bound to render to William Barneby, Lord of Lastres, in Herefordshire, for a parcel of the demesne lands,—"xx d., and one goose fit for his lord's dinner on the Feast of St. Michael the Archangel." Another writer alludes to the agreement thus:—

> And when the tenantes come to pay their quarter's rent,
> They bring some fowle at Midsummer, a dish of fish at Lent,
> At Christmasse a capon, at Michaelmas a goose;
> And somewhat else at New Year's tide, for feare their lease fly loose.

Indeed, the majority of the leases in the olden times included items such as above, and if not brought their lease would be void.

In connection with this variety of waterfowl, they were always held in high appreciation in England, the price in the early days being worth noting.

In 1450, the Mayor of Rochester gave an entertainment to King Edward IV, on Michaelmas Day, and paid for "one gose and two pigges xviii d". Stowe, in his "London," 1616 edition, says that in 1331, the price of a fat goose was fixed at 2½d., a fat capon 2d., a fat hen 1d., and 24 eggs 1d.

In the reign of Richard II, 1377, like most other commodities, the price of a goose was fixed,—the best goose 6d., a mallard 3d. The price evidently did not alter much for the following hundred years, for at the Candlemakers' Feast, 1478, the cost of a goose was put down at 6d. From that period they gradually got higher in price, until early in the nineteenth century, when the annual value of the goose and its progeny was reckoned to be equal to that of a ewe sheep, and sold at the same market price.

Goose-breeding became a great English industry, particularly in the fens, where some rearers produced as many as from 5,000 to 8,000 every season. Of late, however, the huge flocks which were one time driven by slow stages to the great goose fairs are getting smaller every year. The importations to England are also falling off, and the prices becoming lower, through the change of taste in favour of the foreign rival, the turkey.

The goose, which for ages was associated with Michaelmas, is now scarcely heard of at that term, while the demand for the Christmas goose, of later years, has disappeared to an extent that the breeding of such in England can now scarcely be called an industry. The huge flocks of thirty or more years ago have entirely disappeared,—goose-breeding now being done but in a comparatively small way, and principally on the agricultural farms of England.

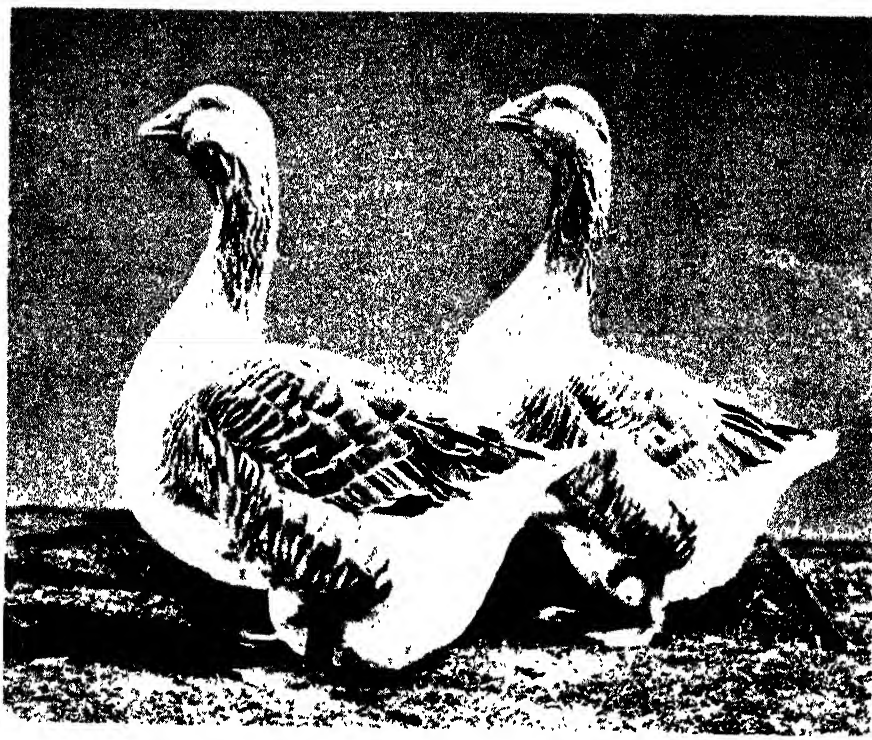
On this subject a practical English poultry breeder writes:—"The main cause for this depression is no doubt a change of fashion on the part of the public. People now prefer the turkey, and the demand for these birds at Christmas is excessive, while that for geese is rapidly decreasing; and those who do now indulge in the time-honored goose at that festive season, usually prefer a medium-sized, meaty, rather than fatty specimen. 'Common' lands where people used to run flocks of geese, have been enclosed, and fens and other marshy places drained, and converted into rich farm lands. Many peasants or cottagers therefore, who at one time could run quite large flocks of geese for next to nothing, are now debarred from doing so. Not so many years ago, many flocks of geese were kept entirely for their feathers, and were plucked four or five times a year. This cruel practice has happily been put down, and with the suppression goose-keeping was given up by many. The feathers are not so valuable as they once were, owing, no doubt, to the fact that the spring mattress has been found to be more hygienic than the feather-bed, which, however, still graces the 'best bed-room' of many respectable houses in our rural districts."

CHAPTER II.

Breeds and Varieties.

There are quite a number of breeds of wild and domesticated geese. The best-known of the latter are Toulouse, Embden, African or Cape, Chinese, Egyptian, Sebastopol, and Canadian.

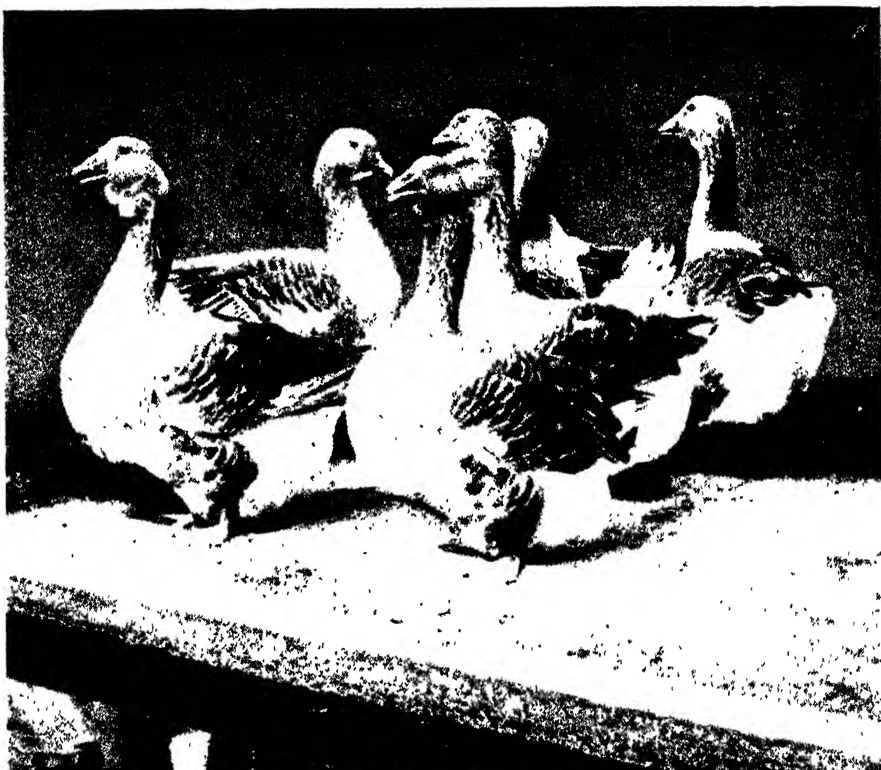
The Toulouse, as the name implies, is called after that city, in the south of France, where they are bred in considerable numbers. They are the largest of all the goose tribe, good English specimens weighing from 20 to 25 lb.



Imported Toulouse.

or more each. They are massive, square, and heavy, with a broad long back, pendant breast, and so deep in keel that the underpart of old specimens touch the ground. The head is broad and deep, and the back, thighs, and wings of a dark steel-grey colour, laced with a lighter shade. The wing flights and breast a solid grey, shading lighter towards the thighs; stern, underparts, and tail white, with a bar of grey across the centre; beak, legs, and feet are orange. This breed usually lay from 40 to 50 eggs in the year. Both sexes are coloured alike, and there is much difficulty during the first year in determining the sex. This breed are nearer non-setters than any other variety, yet some make good mothers. The goslings are greenish-yellow in colour, and hardy.

There are very few pure-bred Toulouse geese in this State, although the majority of the geese we have, have the Toulouse markings and shape, few reaching even half the size of good pure Toulouse. An occasional pair of pure-bred Toulouse appear at some of our shows, but, from whatever cause, they do not appear to increase in numbers. The first illustration is that of Toulouse imported a number of years ago for the Hawkesbury College, one pair of which weighed 50¾ lb. when taken out of the ship's coop.

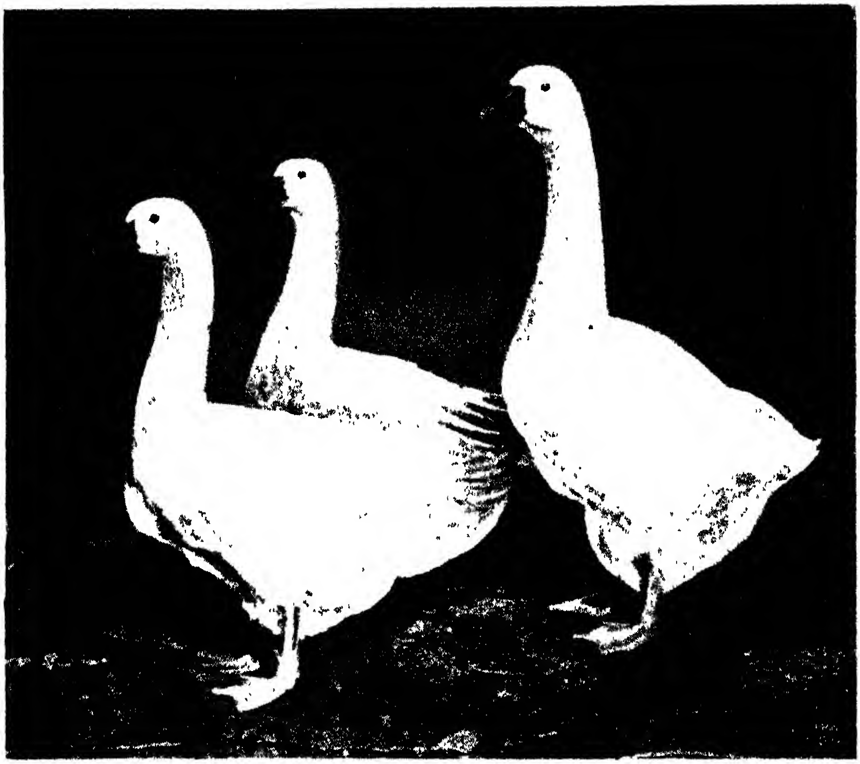


Toulouse at Hawkesbury College.

Embden.—The Embden geese differ but slightly from the Toulouse in shape. The build is finer, the head longer, and there is no dewlap. They have not the great pouch development as has the Toulouse, and appear longer in the leg. The eyes are blue; the legs, feet, and bill bright orange, and the plumage pure white. They are not such good layers as the Toulouse, but lay larger eggs. They received their name from the town Embden, in Holland, from whence they came to England. The goslings are yellow when hatched, but change to white as the feathers grow.

The late Harrison Weir, who bred this variety largely, says :—"The Embden or Bremen geese have deteriorated of late years by being crossed with the Toulouse. Many have inherited the large dewlap and bagginess of skin peculiar to that breed. They are also less compact and close in feathers, and not such steady sitters as they once were. The Embden goose

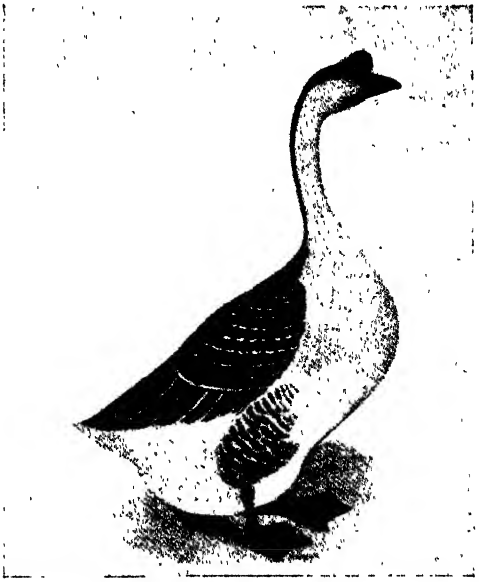
fats very quickly and evenly, and the flesh is very delicate, tender, and juicy; the skin thin, and not oily like that of the Toulouse. Embden ganders, or geese of large frame, do not come to maturity until two years, some growing for a longer period. In 1858, Mr. Fowler's pair of White Embden at Birmingham show weighed 57 lb.; Mr. Mansfield's, second prize, 55 lb.; third prize being 54 lb. At Birmingham, the following year, Mr. Price won with a pair weighing 63 lb.; the next, 53 lb.; and the third,



Embdens.

48 lb. At the Crystal Palace in 1861, the first prize pair weighed 63 lb., and then for a number of years they deteriorated in size. The first prize pair at Birmingham in 1878 were but 48 lb. Mr. Weir attributed the decrease in the weights to the foolish fallacy of crossing the breeds, which, for the time may be successful, but is detrimental to the improvement of any variety in the end, adding, "I have always found that keeping any variety of poultry or other stock pure, and selecting the strongest, healthiest, and best formed, is the right way to attain the highest and, at the same time, the most permanent excellence; and those breeders who act on this principle always find the progeny not only come truer and more equal in their general characteristics, but they maintain an evenness and quality which is not to be procured in any other way; at least, such is my firm opinion, gained from observation and a life experience."

Chinese.—These are sometimes termed the African or Knobbed goose, and are kept in America extensively, owing to their very superior laying qualities. Not that geese eggs of any variety are a marketable commodity, but rather that, from the thirty to forty eggs laid by the Embden or Toulouse, ten to fifteen goslings may be the entire year's produce. The Chinese, on the other hand, lay two or three settings in the season; and, as the eggs are usually fertile, it is nothing unusual for one goose to be the parent of twenty or thirty goslings in a year.



African or Cape Goose.

In carriage, the Chinese goose

Toulouse at Hawkesbury College.

differs largely from those already described, it being upright and stately, with a long, erected neck. It also differs from the Embden and Toulouse in having

a large knob at the base of the upper mandible, and a pouch-like appendage under the lower mandible, at the top of the throat. There is a white line extending along from the base of the skull, and continued behind the frontal knob, which is black, while the colour below and nearly surrounding it is orange. A dark brown or nearly black stripe runs down the back part of the neck from the head to the back; the fore part of the neck and breast are a dun colour, and the other upper parts brownish-grey, edged with a lighter colour. The under parts are white, and the legs yellow or a sooty brown. The heaviest specimens of this breed, when full-grown, weigh about 14 lb.

There is also a white Chinese goose, possessing a carriage of its own, and has been described as the most beautiful of all the domesticated goose family. In their motions they are particularly graceful, and their long necks and well-formed bodies add to their beauty, which is enhanced by the pure white plumage and the brilliant orange-red of their bill and knob. The white are somewhat larger than the coloured Chinese goose, but it does not lay so many eggs. Both varieties have a rather shrill, harsh voice, more noisy and disagreeable than that of the Toulouse or Embden.

Chapter III.

Geese in Australia.

There are quite a number of varieties of geese other than those mentioned, viz., Egyptian, Sebastopol, Danubian, Canadian, Russian, &c., but as we have none of these in Australia detailed description is unnecessary, particularly as none of them are of much value for profit making.

So far as Australia is concerned very few pure breeds are stocked, and those now bred are largely a mixture of Embden and Toulouse, and further crosses with the Cape, the latter being bred in moderate numbers on account of their better laying qualities, but all, wherever kept or bred, are of small size, mere bantams in relation to the standard weights of the Toulouse or Embden.

We are not told exactly how many geese arrived by the first fleet, but from a return taken three months after landing, the poultry had increased to 28 turkeys, 35 ducks, 142 fowls, 87 chickens, and 29 geese.

That the feathered stock increased considerably can be assumed from the fact that in 1796 there were regular market quotations for all animals and produce, and while wheat was 12s. per bushel, flour 7½d., mutton 2s. per lb., pork 1s. 6d., and butter 3s., full-grown fowls and ducks were but 5s., and geese and turkeys 21s. each, and eggs 2s. per dozen. The prices of poultry it will be seen were then very little in excess of what they are now, evidencing the excellence of the climate for poultry-breeding. The high quotations for other stock show that they multiplied less freely than the poultry.

Captain Macarthur, writing to a friend in England, about the same time, describing his stock, added, "Poultry of all kinds I have in abundance." Indeed, the abundance of the poultry was so great that the following year, 1797, they were omitted from the stock returns of the State, the omission

remaining for 110 years, poultry for the first time from the period mentioned being included in the stock sheets which were issued at the end of the past year.

What the class of geese were which arrived over 120 years ago we know nothing of, except that, as the stock in England at that time was largely what is known as the grey lag, we may assume those first brought out were of this variety, and the progenitors, with recent pure blood admixture, of the present goose stock of this State.

Goose-breeding in Australia, for various reasons, has never attained the importance it has in the older countries. To many it may be thought that, as geese are largely grazing animals, this country, with its boundless acres, would be an ideal one for their breeding. Such is not the case, our climatic conditions being such that frequently those who have kept a few geese, and have had a good season with them, increased their stocks with the object of largely extending their operations to the end of greater profits the following year, and no sooner was everything set in order for something to open one's eyes in profitable goose-breeding than the inevitable drought set in, and, as in the season now past, districts which should be ideal ones for the industry were for several months unable to graze half a dozen to the acre, the effects of which are that through this ill-feeding the quality of the breeding stock has so deteriorated that even in good seasons a goose to be found weighing 10 lb. is a novelty. The same handicaps to profitable keeping of these waterfowl obtain in all the States, with the result that, except guinea fowls, they form the smallest number of all our domesticated poultry.

At time of writing our stock returns have not been published, but it will likely be found, when the figures are made public, geese will not form more than 1 or 2 per cent. of the total poultry enumerated. In the Queensland stock returns for the past year fowls, ducks, and turkeys numbered about three-quarters of a million, geese totalling 8,700. In New Zealand the fowls, ducks, turkeys, and guinea fowls numbered 3,200,000, and there were but 44,000 geese. In Victoria, at latest enumerating, there were but 76,000 geese to about 4,000,000 of the other classes of poultry stock, while in West Australia the latest returns showed 476,103 fowls, 72,018 ducks, 34,868 turkeys, and but 7,740 geese.

In the absence of any enumerations in this State the exports of a few years ago afford a fair guide, and confirmatory of the rather small place geese occupy in the poultry flocks of the Commonwealth. For the three years ending 1902 there were exported through the Government Export Depôt 167,500 fowls, 54,120 ducks, 11,830 turkeys, and but 4,320 geese, and this despite the fact that there were unlimited orders for them. One other feature which tends to lack of interest in geese breeding, but peculiar to this State only, is the extraordinary quantity of Muscovy ducks which are bred, the large suburban duck farms stocking them in preference to the English.

The drakes of these weigh as heavy as the ordinary goose, and being fed to produce the greatest weight in the shortest time the flesh is deliciously tender, and of esteemed flavour, whereas the goose is generally allowed to find its own living, is rarely fattened, and consequently the flesh is of a fibred nature and dry.

The merits of the Muscovy has of late years become generally acknowledged, the one-time patrons of the goose for the Sunday dinner now invariably asking for the Muscovy drake, in spite of it costing more money.

CHAPTER IV.

Breeding Geese.

From what has been said, it will be seen that the climate for goose breeding is but erratically suitable. They lay but a small number of eggs in comparison with other poultry, and, at best, the market is not a good one. With all these handicaps they are still patronised by a few suburban poultry keepers, some of whom have no reason to complain of the financial results, while others treat them in such a way that profits cannot be expected.

Geese are essentially grazers, and where the grass is good can live on it alone the year round, but, whether house-fed or not, extensive grass land, roadside, or paddock is necessary. Where the ground is unenclosed they often wander long distances. They keep together like sheep, and return home in the evening. Water to swim in is not required for the young stock, but to secure fertile eggs it is an essential.

Three geese are usually given to one gander. The goose, although living to a great age, commences to breed early, the best results coming from those from two to four years of age. Still they breed up to twelve years or over, infertile eggs being rare even at that age.

There is often difficulty in distinguishing the sexes. The ganders, however, are usually thicker in the neck, and coarser looking ; the geese rounder and fuller at the stern.

In England it is usual to house geese in the winter ; such, however, is not necessary in Australia, they having a special desire to keep in the open. A piece of low swampy ground with ponds or waterholes is excellent for them ; at the same time they delight to rest on a sunny bank.

Geese lay from twelve to twenty eggs. When they want to sit, some breeders put the first laying of eggs under hens, and allow the goose to sit on the second or third laying of eggs ; she will cover eleven or twelve ; a hen will cover from five to seven eggs. Muscovy ducks are sometimes used here, and cover eight to ten or twelve. Geese eggs can also be successfully hatched in incubators. If the goose is allowed to hatch the eggs, she must be fed daily near the nest, and the gander will protect her most courageously.

Twenty-eight days is the usual time required to hatch the eggs, but it is often thirty days before the hatch is complete. When hatched the goslings do not require any food for twenty-four or thirty hours, and, if hatched by a goose, can be safely given to a broody hen, who will usually rear the lot ; the goose will then lay a second or third lot of eggs. If the young are left with the goose, she occasionally treads on some of them, this being avoided if they are given to a hen.

The first food for the goslings may be stale bread crumbs moistened, fresh pollard and bran, or oatmeal ; all should be made crumbly, not sticky.

Some give the young goslings for a day or two hard-boiled eggs; there is no necessity for this. In America, fine maize-meal takes the place of the pollard and bran for the early food. Water should be supplied in a shallow dish, in which some gravel, coarse sand, pebbles, and cinders are placed; grass is the natural food of goslings, and if of a soft, tender nature, the young goslings take to it shortly after being hatched, and when the supply is plentiful, the cereal food can be gradually dispensed with. For the first few days, whether brought up by a hen or a goose, they should be confined, but full liberty is best, provided they have some protection from sudden showers or storms, and the hot sun. When a few weeks old, cracked corn can be given, and with this and the soft grass one can almost see them growing.

It should be mentioned that rats have a distinct partiality for young goslings, many being lost in this way, while they often fall a prey to crows, magpies, and hawks.

It has been shown that there is not a great market for geese in Australia, the quality, as a rule, being poor, and the prices consequently low. At the same time, despite the goose's latter-day rival—the turkey—there is still a demand at Christmas for all that are available, and, should a little care be taken in fattening, there is no doubt that the extra price received would well pay the little additional expense of extra food.

To get fat geese for Christmas, they should be allowed the usual grazing exercise, and about the beginning of November be given two or three meals a day of oats, barley, wheat, or maize. The latter will assist in putting on internal fat, rather than flesh, and is, consequently, not recommended. If the grass is scanty and dry, as it sometimes is prior to Christmas, vegetables such as turnips, potatoes, &c., can be used, while barley meal and pollard will make a valuable addition, and in all cases they will be found easier to fatten than either fowls or ducks, but being good feeders the expense is greater.

The English Board of Agriculture, which of late years has issued several bulletins on poultry-breeding for farmers, prior to Christmas last sent out the following leaflet on geese, which it will be seen is in accordance with much of what has been said in this article:—

It is not generally wise or desirable to run geese in any but small flocks, except in very special circumstances of accommodation or profitable outlet, the ordinary demand being limited and variable. In many, perhaps most, localities a moderate supply will nearly always find a remunerative sale as goslings; or the birds may, without undue risk, be sent off the grass to London during the season. The distinctive goose market at Michaelmas has practically ceased to exist; there is still a demand at that time of year, but not materially greater than that which now prevails during earlier months. Where stubbles are available, some of the birds may be profitably run on them for the autumn markets, or fattened later for Christmas, when there is a more or less considerable demand for fat geese. At the latter season, however, the goose occupies a second place to the turkey; moreover, the position of the English goose at Christmas is further assailed by the imported goose, many poulterers regularly stocking foreign birds to the entire exclusion of English, on account of the more favourable wholesale price. Unless, therefore, the English producer can market birds of exceptional quality, he will find the average Christmas market unsatisfactory, and would perhaps do better to dispose of his goslings off the grass in May and June.

Breeds.

For the English farmer, or commoner, the best breeds for purely table purposes are the Embden and the Toulouse, or a cross between the two.

The Embden has white plumage, flesh-coloured bill, orange shanks, a square, deep-set body, and a tall, upstanding carriage. The average weight for an adult gander is 20 lb., and for a goose 18 lb., but much greater weights are attained.

The Toulouse is of a dark grey colour on the upper part and a lighter shade on the breast, which gradually merges into the white of the under part; the bill is of a red flesh colour, and the legs orange-red; the body is full and compact, with a convex back. The weight is generally greater than that of the Embden.

Breeding.

Geese will continue to produce eggs profitably until an advanced age, and several geese which are now 19 years old have averaged fifty-five eggs each per year during the last five years. For hatching purposes the eggs of mature birds are much more reliable than those of young stock; the risk of infertility is reduced, and the vigour and hardiness of the goslings increased. Rearing, therefore, being easier, the profit is more assured. The breeding-pen should consist of a gander and two or three geese; the geese will commence to lay in February, or not later than early March, producing (if not permitted to sit) an average of from fifty to sixty eggs in a season. An ordinary hen will cover four or five goose eggs, ten being a suitable number for a goose; the period of incubation is thirty days. The stock birds may be housed in a roomy shed, well littered and having a wire-netted open front; when the laying season approaches, a rough nest should be made in a convenient place, and provided with an ordinary nest egg. If this is not done, the eggs may be dropped near the water to which it is necessary that the geese should have access, not only for swimming, but also to ensure fertility in the eggs. Stock birds should usually have a small allowance of soft food in the early morning, and a little corn when they return from the fields at night.

Rearing and Fattening.

When hatched, the goslings should be cooped out with the hens that have hatched them, in the same manner as chickens, and during the first week or two they should be fed frequently. For the first few days they may be fed on biscuit-meal, or soaked bread, mixed with a good proportion of well-chopped dandelion leaves. This may be changed to Sussex ground oats and boiled rice at the third or fourth day. By the end of the first week they will have made considerable progress as grazers, and their rations will consequently not require increasing in the same proportion as those of other growing stock. By about the tenth day they will be able to do without any brooding, and the hens may be turned out and brought into condition for laying again. On a suitable grass range they will then make rapid progress with a comparatively small allowance of bought food.

Early Marketing.—When goslings are reared for early marketing, their grass range should not be too extended, and they should not be allowed to enter swimming water; in addition to the grass, the food should consist of two moderate meals daily of a soft mixture, in the making of which barley-meal, middlings, and a small proportion of brewers' grains may be used. Goslings thus treated should be in good killing condition before they are three months old.

Autumn Marketing.—Goslings intended for the autumn market should be run free during the earlier months, or may, during part of the time, be folded on turnips, being more closely confined for the last month before killing, and fed on meal and brewers' grains.

Marketing in Winter.—When kept for winter fattening, goslings should, from the time they are feathered, be allowed the same liberty and be treated in the same manner as old birds, being confined to a roomy, open-fronted shed for a month or five weeks before killing, and allowed two full meals daily. The meals should consist of soft food in the morning and corn in the afternoon—the grain being fed in the water troughs with a good supply of grit. It is also necessary to keep the fattening birds well supplied with green food during the period of their confinement.

The best fatted geese of late years at the Christmas market in London fetch but 6d. or 7d. per lb. dead weight, while best full-grown live goslings realise but 4s. 6d. to 5s. 6d. each.

Geese, like ducks, have few ailments, and with ordinary care keep in good health. The hot sun affects the goslings as it does ducklings, and sometimes they get leg weakness. In America of late, on some big goose-breeding establishments, a terrible disease, termed goose cholera, broke out, causing great mortality. Fortunately, unlike the turkey disease, it has not reached Australia, and as there are no prospects of imports from that country, we may be happy in the thought that of the few handicaps to profitable goose-breeding, disease is not one of them.

Packing and Marketing Citrus and other Fruits.

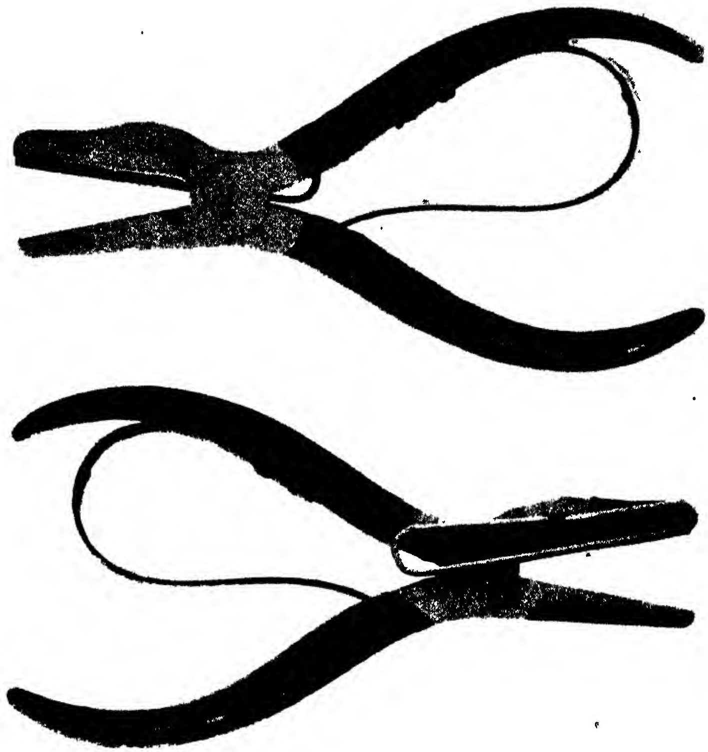
W. J. ALLEN.

THERE are few, if any of us, who have arrived at the stage of perfection either in the care of our orchards or the picking and packing of our fruits. We all know, or should know, that a starved orchard cannot possibly be a profitable one; and yet there are growers who go on from year to year until the soil becomes so impoverished that they are reluctantly compelled at last to admit that fruit-growing under these conditions does not pay, and the treatment necessary to bring the worn-out orchard into condition would be too expensive for them to undertake. In the first place, why allow the land to become run down? Some will answer that their soil was always poor. Then why embark in fruit-growing on such soil, unless the person doing so is competent to undertake the treatment of such soil? We all know that the man who is heavily handicapped at the beginning usually has an up-hill task to keep pace with his more favoured neighbour who has started on good, sound lines by purchasing good land and planting it with some of the best known commercial varieties of fruits. He has also given the cultivation his most careful attention and the spraying of trees for pests, and has attended to the up-keep of the land, with a clear understanding that it will not do to take everything from the soil and give it nothing in return. The result with this class of grower is that his trees produce crops of the quality of fruit which finds ready sale on the markets at top prices, while his unfortunate neighbour has a difficulty in finding a purchaser for his indifferent fruit, and has to accept about half the price obtained by the careful grower, who has made a business of looking after his place, as before stated.

The reader may ask what connection have the above remarks with the picking and marketing? Well, they have nothing beyond the fact that the man who does not grow the best fruit cannot possibly market any, and he should not be disappointed if his agent does not get good prices for it, nor has he any just cause of complaint if he finds that he is making only a bare living from fruit-growing.

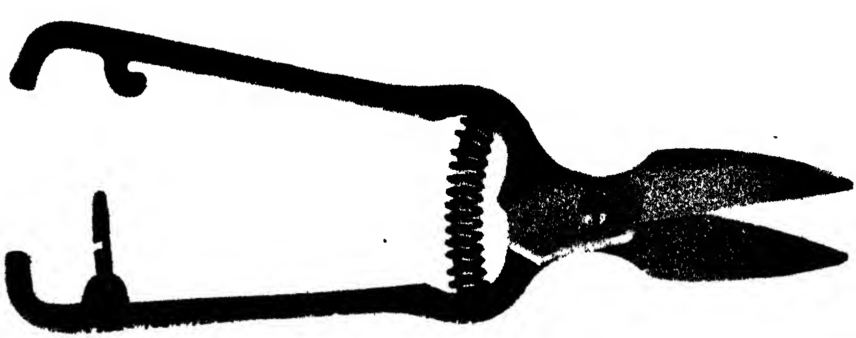
In marketing fruit there are several important things which must receive careful attention, viz. :—

(1) In picking the fruit see that the work is carefully done, so as to avoid bruising or damaging in any way. If it is citrus fruits that are being picked, proper clippers for the purpose should be used. With these the stems can be cut off close to the fruit without the slightest risk of cutting the latter, but where ordinary pruning shears are used there is always a risk of cutting or puncturing the skin with the points of the blade. If fruit is intended for export it should be cut from the tree, and not pulled.



Fruit Clippers. (Snyder's patent).

The clippers shown above are the best form on the market, the ends of the blades are rounded, thus preventing any danger of puncturing the fruit. These clippers are provided with a spring attachment, shown in the lower view, which holds the cut fruit by the short stem.



Pomona Fruit Clippers.

The blades of these clippers are slightly bent to enable the stems to be clipped quite short; however, as they have sharp points, it is almost impossible not to puncture some of the fruit occasionally.

Cases should never be filled so full that when one is stacked on the other the top fruit will be bruised. If there are any rough roads to be traversed

between the orchard and the packing-house, spring carts rather than drays should be used, else the fruit may be shaken about and bruised.

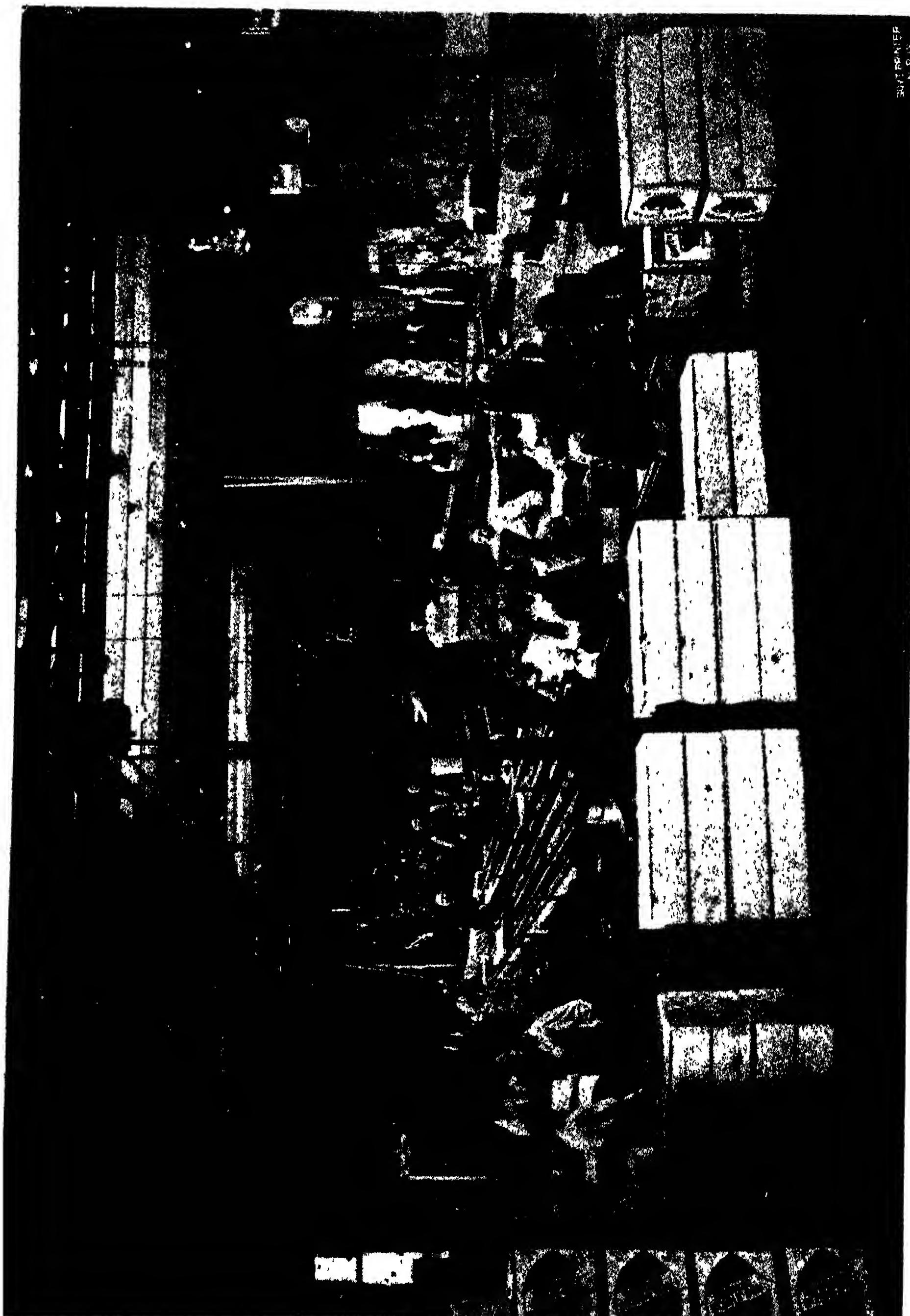
Damaged or bruised fruit is always the first to decay, and when once a specimen becomes rotten in a box, there is always a great risk of many more fruits surrounding it going bad also.

(2) *Grading.*—It is most important that all fruit should be graded evenly for size, colour, and quality. For instance, a $2\frac{1}{2}$-inch fruit should not be packed in the same box as fruit $2\frac{3}{4}$ to 3 inches in diameter. Again, bright and dull fruits, although of the same size, should not be packed in the same case. In the case of oranges, a soft or rather thick and loose-skinned or

Small Grader and Orange Press.

puffy specimen should never be packed with a firm orange, as one spoils the appearance of the other. Scarred or thorn-pricked citrus fruits should never be exported, as the cost of sending poor, or badly graded and selected fruit is just as great as that of well-selected, sound, good fruit; and while the chances are that the former fruit may make a loss for you out of the shipment, the good fruit is your only hope of success.

Packing.—See that only one grade is put in any one case, that is, the fruit should all be of the same size, quality, colour, and should be neatly wrapped. Proper wrappers can be purchased by the thousand for the various sized fruits, and a $2\frac{1}{2}$-inch fruit should not be wrapped in a paper large enough to accommodate a 3-inch fruit, nor should a 3-inch fruit have a



Interior of the Azusa Foothill Citrus Association s Packing-house, California (showing large grades).

wrapper put on it which has been cut to fit a $2\frac{1}{2}$ inch specimen. The following will be found about the right sizes for the different fruits :—

Wrapping Papers.

Oranges and Apples.

Size of Fruit. In. in diameter.	Size of Paper. Inches.
$3\frac{1}{2}$	12 x 12*
$3\frac{1}{4}$	12 x 12
3	12 x 10
$2\frac{3}{4}$	10 x 10
$2\frac{5}{8}$	10 x 8
$2\frac{1}{2}$	10 x 8
$2\frac{3}{8}$	10 x 8
$2\frac{1}{4}$	8 x 8

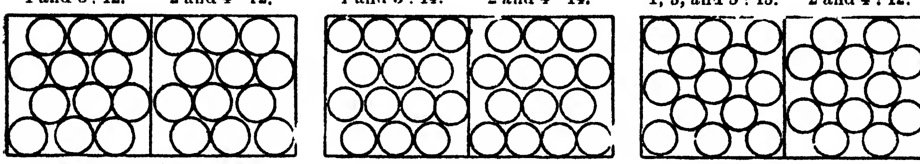
Lemons and Pears.

Size of Fruit. In. in diameter.	Size of Paper. Inches.
Over $2\frac{7}{8}$	12 x 12†
$2\frac{7}{8}$ & $2\frac{3}{4}$	12 x 12
$2\frac{1}{2}$	10 x 10
$2\frac{3}{8}$	10 x 8
$2\frac{1}{4}$	8 x 8

* Rather close fit.

† Should be known as pumpkin lemons.

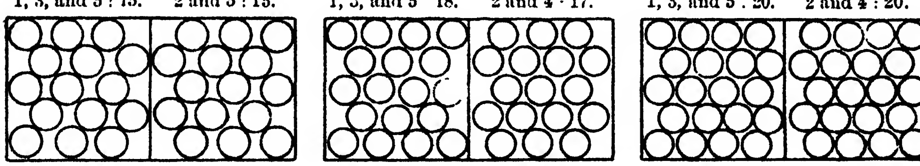
Layers, 1 and 3 . 12. Layers, 2 and 4 12. — Layers, 1 and 3 . 14. Layers, 2 and 4 · 14. — Layers, 1, 3, and 5 : 13. Layers, 2 and 4 : 12.



Number and size, 96. Diameter, $3\frac{1}{2}$ in. ; layers, 4 — Number and size, 112. Diameter, $3\frac{1}{4}$ in. ; layers, 4. — Number and size, 126. Diameter, $3\frac{1}{8}$ in. ; layers, 5.

Fig. 1.

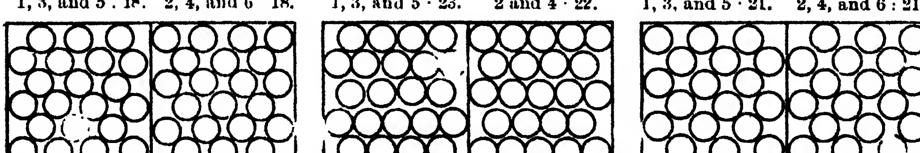
Layers, 1, 3, and 5 : 15. Layers, 2 and 5 : 15. — Layers, 1, 3, and 5 18. Layers, 2 and 4 · 17. — Layers, 1, 3, and 5 . 20. Layers, 2 and 4 : 20.



Number and size, 150. Diameter, $3\frac{1}{16}$ in. : layers, 5. — Number and size, 176. Diameter, $2\frac{15}{16}$ in. ; layers, 5. — Number and size, 200. Diameter, $2\frac{13}{16}$ in. ; layers, 5.

Fig. 2.

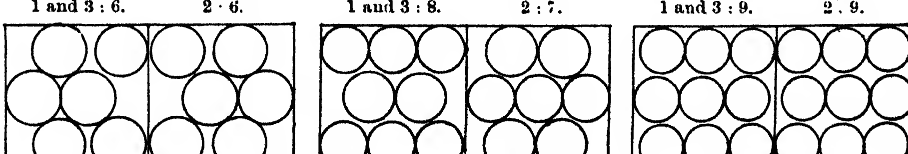
Layers, 1, 3, and 5 . 18. Layers, 2, 4, and 6 18. — Layers, 1, 3, and 5 · 23. Layers, 2 and 4 · 22. — Layers, 1, 3, and 5 · 21. Layers, 2, 4, and 6 : 21.



Number and size, 216. Diameter, $2\frac{11}{16}$ in. ; layers, 5. — Number and size, 226. Diameter, $2\frac{9}{16}$ in ; layers, 5. — Number and size, 252. Diameter, $2\frac{3}{8}$ in. ; layers, 6.

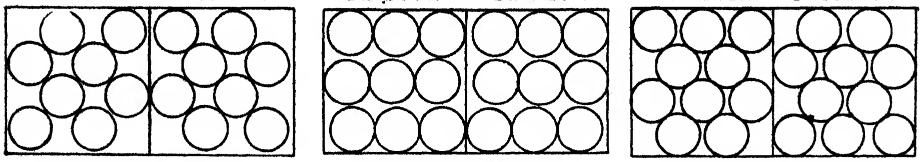
Fig. 3.

Layers, 1 and 3 : 6. Layers, 2 · 6. — Layers, 1 and 3 : 8. Layers, 2 : 7. — Layers, 1 and 3 : 9. Layers, 2 . 9.



Number and size, 36. Diameter, 5 in. ; layers, 3. — Number and size, 46. Diameter, $4\frac{3}{4}$ in. ; layers, 3. — Number and size, 54. Diameter, $4\frac{1}{2}$ in. ; layers, 3.

Fig. 4.

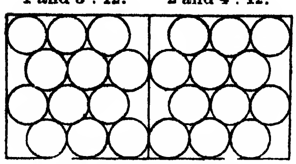


Number and size, 64. Diameter, 4½ in.; layers, 4.

Number and size, 72. Diameter, 4⅛ in.; layers, 4.

Number and size, 80. Diameter, 4 in.; layers, 4.

Fig. 5.



Number and size, 96. Diameter, 3⅝ in.; layers, 4.

Fig. 6.

The accompanying diagrams from Professor H. H. Hume's Bulletin, No. 63, Florida Agricultural Experiment Station, illustrate the arrangement of the different sized fruits. Figs. 1, 2, and 3 show the arrangement of oranges according to their diameters to secure the cases being packed uniformly. Figs. 4, 5, and 6 show the arrangement for pomelos (grape-fruit). In packing, the cases are usually filled so that the last tier of fruit projects about $\frac{1}{2}$ inch above the top of the box. After the case is packed, it is placed under a press (see Fig. 7) and the lid gently forced into position. The system of "jumping" the cases by a hard rocking movement on the bench or floor cannot be too strongly condemned for fruit intended for export. In the above diagrams the cases are the 2 cubic feet ones used in California.

In packing-houses in other countries, it is customary to have the name of the packer nicely printed on the wrappers, and many different colours are used.

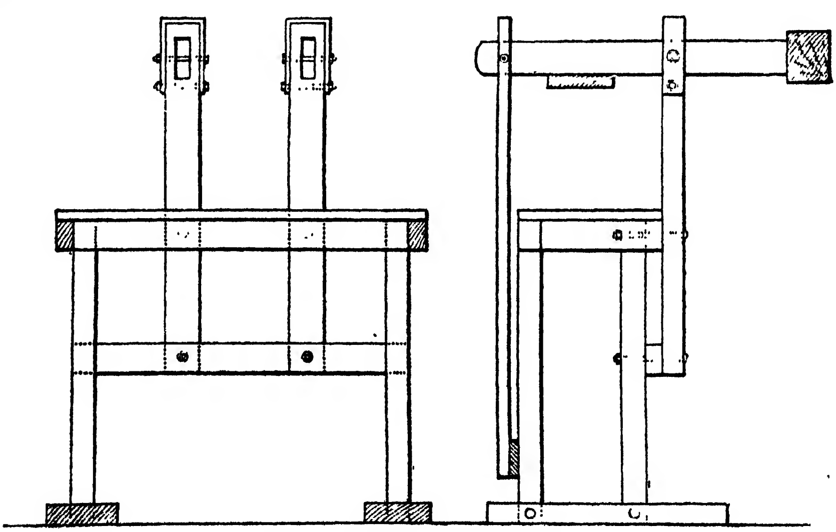


Fig. 7.—Details of Orange Press.

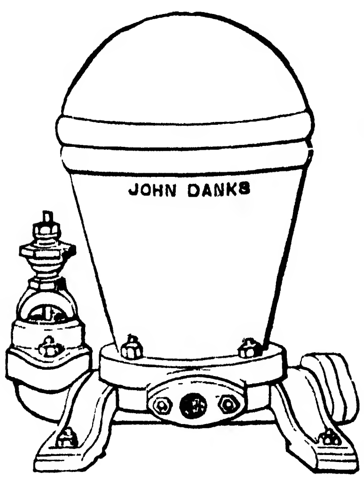
N.B.—In the above illustration of an orange press the cross rods forming the lever are too thick and are an impediment to the operator when nailing on the lids. This lever should be thin and narrow, say ¾ x ½ iron.

Small Irrigation Areas.

W. R. FRY,
Fruit Inspector.*

THE recent copious rainfall throughout the State has relieved farmers and stockowners of much immediate anxiety and labour. It is to be hoped, however, that the experiences in the coastal areas will not be forgotten, but that ensilage-making and provision for irrigation will receive more attention.

It is somewhat surprising that more irrigation has not been practised in many places where running streams occur. Certainly the water in permanent streams cannot always be utilised by settlers without infringing on the riparian rights of others. However, when a stream rises in a farmer's paddock and merely creates a swampy patch,—from which most of the water is lost by evaporation,—the owner or occupier could justly and profitably irrigate a few acres by gravitation. In streams with sufficient fall, part of the water could often be diverted by means of an automatic hydraulic ram. These rams are comparatively cheap (from £3 upwards according to size), and will effectively raise a small supply from 30 to 150 feet high, without any cost for fuel or attention.



Hydraulic Ram.

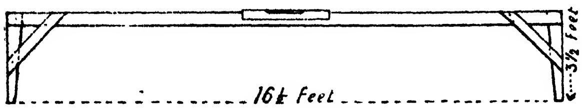
Again, suitable spots are frequently seen where a valley could be easily dammed and a few thousand gallons of water impounded, to be gravitated or syphoned on to a cultivation patch as required.

Several opportunities for these methods occur in the Moss Vale and other districts, but in very few cases have they been practised. Possibly the chief reason is that the necessity for irrigation has never before been so apparent; but in other cases, it may be due to a want of knowledge of the advantages or practice of irrigation.

Many people, when the subject of irrigation is discussed, speak as though it required a great expenditure for costly pumps, pipes, cement drains, and special implements. For large areas, permanent, and therefore costly, appliances are necessary; but a few acres can often be cultivated by the judicious use of the plough, with a little fluming of the most primitive materials. In the Kangaroo Valley, for example, the trunks of the cabbage-tree palms are frequently used for water fluming, whilst hollow logs, and even strips of bark,

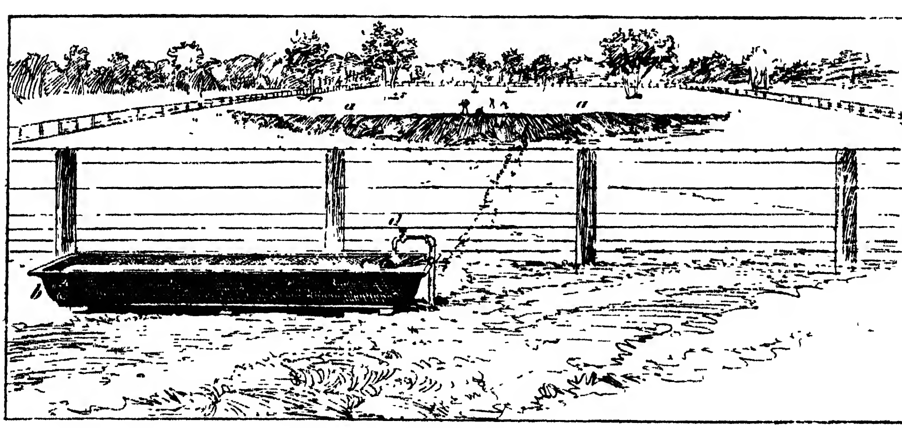
* Formerly Manager, Moree Irrigation Farm.

are used in other cases. With an ordinary spirit level on pegs or a home-made A level, it will often be found that water can be brought on to land apparently higher than the stream. Old miners are generally expert in constructing water-races, and several examples of their industry can be seen around Adelong and other old mining districts.



Home-made Level.

Although to many people these schemes may appear paltry, they go to prove the possibilities of more extended areas, and provide that practical experience which will be necessary when larger water supplies are available. Settlers should not be above considering such methods, even if the irrigable area is small,—for it is really wonderful what an amount of succulent fodder can be obtained from a small area. Only 2 acres planted with sorghum will, with watering, produce over 40 tons of green stuff. This would, lately, have been very acceptable on those dairy farms where the occupiers were carting prickly-pear for miles, or paying prohibitive prices for hay. Even the overflow from a windmill tank could often irrigate a small patch, and thus save a little of the expensive hay.



Gravitating Scheme for stock or garden.

Coming to the actual application of water to crops, the chief object should be to ensure an even supply. This even supply of moisture—not too much and not too little—is absolutely necessary for perfect plant development. To quote the words of a well-known agricultural lecturer,—"Plants *drink* their food, they don't eat it." It has been, unfortunately, too often demonstrated that the best artificial fertilisers or the richest basaltic soils are utterly useless without sufficient moisture. To artificially supply this moisture, "sprinkling" may appear the most natural method, but it is seldom practised for farm crops. In the town of Picton (which rejoices in a water supply at 1d. per 1,000 gallons) some Chinamen have rented a few acres

of land from A. H. Antill, Esq., and erected tall poles, with outstanding spars to carry hoses and sprinklers. The vegetables are growing luxuriantly; but the method does not appear an unqualified success, and probably the furrow system of watering would be just as effective, and more economical. Surface sprinkling, although extensively practised in suburban gardens, only gives best results when the soil is covered with a good mulch or heavy foliage of plants. Unless a thorough soaking is given, most of the moisture is evaporated by the next day's heat. Sprinkling when the sun is scorching hot, although often practised, is certainly unnatural, and has not nearly such a good effect as on a dull day or at night-time.

Theoretically, the best time to apply water is when the weather appears like rain, as the moisture is then received under natural conditions of atmospheric pressure and evaporation. In practice, however, water must be applied whenever the leaves of the plants show that the moisture content of the soil is below their requirements. This is one of the reasons for the frequent statement, that "a shower of rain is better than hours of sprinkling." Another reason is that the first showers of rain after thunder (especially hailstorms) generally contain a small quantity of ammonia and nitric acid from the electric disturbances, and this has a stimulating effect as an immediately available plant food. The initial cost of pipes and taps is another disadvantage of the hose and sprinkler method, which may be dismissed, as seldom applicable for farm crops.

The flooding and check system of watering, as practised in many parts of America, has not been generally adopted in this State, except for lucerne and permanent pastures. Flooding invariably leaves the land very hard and sodden, and requires more preparation of the land. Grading and levelling is generally necessary to prepare any extensive irrigation area, but the process is rather expensive, and not always easy for the average farmer. Where the soil is shallow, as in most parts of Cumberland and Camden, extensive grading operations are not practical, for it is evident that if 18 inches of the surface soil is scraped away, it will be years before the bare patch of subsoil will produce profitable crops.

How to Irrigate.

By the furrow system, which is the best for most crops, land can be irrigated even on a hillside, provided the contour of the land is considered when striking the drills. The distance apart of these furrows depends on the kind of soil and the fall. If the newly sown land is of a clayey nature, and very dry, the furrows may be 6 to 9 feet apart, as the water will spread out in a lateral direction. With a steeper fall, or more porous soil, the furrows must be closer together. The furrows can be made with an ordinary plough or a cultivator, and should be parallel. All dead furrows or "clean outs" should be ploughed in before the cross furrows are made. Having succeeded in bringing a supply of water to the highest point in the main channel, the next object is to get it *into* the soil. To distribute it evenly to each furrow, short lengths of pipe or turfs are necessary. Sluice-boxes, or pieces of board

containing an inch auger hole, are also useful. Care must be taken not to rush too big a stream down the furrows at first, or the soil may "slicken," or become puddled, and prevent percolation. In watering maize or sorghum, water is best applied down every alternate furrow to germinate the seed, and then down every row when the plants are growing well.

Frequent surface cultivation is a most essential operation after furrow irrigation. The settler who, when asked why he did not use more horse-hoe and less water, replied, "I can sit down to irrigate, but have to walk to cultivate," explained a too common cause of failure amongst irrigators.

When the soil commences to crack after irrigation, it is time to cultivate, *not* irrigate. On clay soils the surface may be cracked and yet the subsoil may be saturated. For fruit-trees, wait until the soil is almost too dry to "ball" when squeezed in your hand before watering again. Surface cultivation destroys the crust, fills up cracks, and by preventing undue evaporation

Furrow Irrigation on Clay Soil.

ensures the necessary even degree of moisture. A good rule in irrigating is never to run water more than once over the same surface. Give a good soaking, and when dry enough for horse-work, stir the soil weekly. With this treatment a 4-inch watering will last two months, whilst without cultivation it will only last a few weeks.

In all cases where the subsoil is not porous, underground drainage is absolutely necessary where irrigation is practised. A heavy fall of rain falling after an irrigation may, in the absence of drainage, do considerable harm, as the soil becomes waterlogged and air-tight. With crops of oats or rape the leaves turn red and growth is stunted, but with lucerne or fruit-trees more disastrous effects follow. The roots decay, encouraging the attack of "white rot," or "mal-di-goma," or the plants may be drowned for want of air. Underground drains, which may be filled with stones, tea-tree, logs, or any available material, take up less room than surface drains, and, if

properly made, are more effectual. In many cases where trouble has occurred with alkaline salts in the soil or water, it has been due to a neglect of this important factor. With underground drainage, a heavy fall of rain tends to leach out the excess of salts; whereas on undrained, flat, clay lands the excess moisture has to escape by evaporation, and the secretion of surface salts is, therefore, increased.

On an irrigation area, heavy manuring, or correct rotation of crops, is necessary. If an irrigated acre of land produces 20 tons of greenstuff every year, it is evident that it must become exhausted sooner than land that occasionally misses a crop owing to drought. Most agricultural returns are more or less

Irrigated Sorghum.

affected by the rainfall, but whilst rain is often a remote probability, systematic irrigation is an absolute certainty. Several profitable crops of strawberries and cauliflowers could have been obtained, and many a milk cheque increased, by the practice of these methods during the past few months. A dressing of lime, in conjunction with drainage and watering, will convert many a sour swamp into a luxuriant fodder patch, and if the feed is not required immediately when grown, it can be easily converted into ensilage.

The application of water by the furrow system followed by frequent cultivation, with provision for drainage and rotation of crops, are the necessary principles of "wet farming," which must be practised by all farmers on any large or small irrigation scheme to obtain profitable and permanent results.

Notes on Flax Growing

GIVING PARTICULARS OF BRITISH AND AUSTRALIAN IMPORTS, AND EXTRACTS FROM BULLETIN BY MR. W. L. MARCEY, DEPARTMENT OF AGRICULTURE, WASHINGTON, U.S.A., BEING EXTRACTS FROM PROF. BOLLEY'S REPORT.

COMPILED BY H. V. JACKSON.

THE Bounties Bill passed by the Commonwealth Parliament having become law, it is possible that some farmers and manufacturers in the State may turn their attention to those crops and their resultant products which are scheduled under the Act.

The cultivation of fibre-producing crops is to be stimulated if possible through payment of bounties, and, therefore, the latest information on some of the plants likely to be grown in this State will no doubt be opportune.

Flax.

Great Britain imports very large quantities of flax, and the following particulars show at the same time which countries are contributing the bulk of the supplies:—

GREAT BRITAIN—IMPORTS AND CONSUMPTION, 1906.

Textile Materials—		tons.		£
Flax	From Russia	46,438	value	1,718,501
Dressed and undressed	,, Netherlands	2,885	,,	163,698
	,, Belgium	16,229	,,	1,118.906
	,, Other countries ..	1,757	,,	65,853
	Total	67,309	,,	3,066,958
Tow or Codilla—				
	From Russia	12,339	,,	343,434
	,, Other countries ...	7,717	,,	148,175
	Total	20,056	,,	491,609
Oil Seeds—		qrs.		
Flax or Linseed... ...	From Russia	170,731	,,	344,255
	,, United States of America	86,105	,,	179,334
	,, Argentine Republic...	555,363	,,	1,132,993
	,, British East Indies...	494,961	,,	1,039,764
	,, Other countries ...	280,940	,,	578,642
	Total	1,588,100	,,	3,274,988
Oil—		tons.		
Linseed oil—Pure... ..	... ...	17,056	,,	345,035
,, —Not pure ...	... ...	1,605	,,	30,064
	Total	18,661	,,	375,099

In addition to the above importations of products derived from the flax plant, *i.e.*, linseed, Great Britain imported hemp, dressed and undressed,

during 1906, to the value of £3,552,359; tow, under the same head, to the value of £159,808. Jute, during the same period, was imported to the value of £8,341,268. The grand total of importations of flax, hemp, and jute, being £15,612,002.

AUSTRALIAN IMPORTS.

The importations of fibre into Australia for the year 1906, under the head of Flax and Hemp, amounted to 87,954 cwt., valued at £167,281; other fibre being also imported valued at £12,400.

Linseed and linseed meal was imported to the value of £5,700.

Linseed cake and oil cake valued at £1,388, and the value of linseed oil imported amounted to £105,309, the quantity being 1,032,118 gallons.

The importation of fibre* from New Zealand amounted to £77,374, and linseed grain to the value of £480.

The countries where flax is mostly produced are British India, Russia, Argentine, and the United States.

The United States Department of Agriculture has devoted a considerable amount of attention to flax culture, and in 1903 Professor H. L. Bolley was sent to European countries to investigate the conditions of flax culture, and a very useful bulletin by Mr W. L. Marcey, being extracts from Professor Bolley's report, was issued in 1907.

The following information given under separate heads will be of value to intending flax-growers in this State:—

Climatic Conditions.

The regions in which the flax crop has been successfully grown, either for fibre or for seed, cover a wide latitude, being within the 10th and 65th parallels of north latitude. New culture areas in southern latitudes also show the crop successfully grown under similar climatic conditions. As at present cultivated in Europe, the limitations as to climate are rather sharply defined. These are probably matters of variety and strain, which have become established because of unintelligent cultivation rather than because of any definite attempts which growers have made to obtain new and suited strains or varieties.

Temperature, rainfall, atmospheric humidity, and soil type directly govern plant distribution. Generally speaking, the flax crop may be said to grow best in the colder parts of the temperate region.

As far as the growth of the seed-crop is concerned, its region of culture may be stated to be similar to that of successful spring wheat cultivation, while the fibre crop is at present produced in regions of heavier rainfall and somewhat cooler and more cloudy skies than those in which spring wheat is usually grown with success. The crop may also be said to possess either general capabilities or varieties and strains, which allow of the production of fair crops of seed flax at least to the southern limits of winter-wheat producing regions.

* Flax and hemp.

The rainfall of two districts may vary much as to amount, yet the results as to soil and atmospheric plant environment remain essentially similar. The less measurable features of sunshine, cloudiness, fogginess, general atmospheric humidity, &c., are matters which vitally affect plant growth, and these are especially noteworthy as affecting the flax crop. For the production of fine long fibre of even quality, the plant must have an even, rather slow development, with few, if any, sudden checks. The cloudy sky and cool humid air, with an even but not too great soil moisture throughout the period of growth, is a feature of all fibre districts.

Soil Conditions.

Observations and studies of the soil relations of the flax crop lead to the belief that the question of soil type and fertility, as affecting the successful culture of this crop, is one of far less importance than has usually been supposed. Nearly all writers on flax culture have thought it necessary to state that flax demands a very fertile soil. The writer's observations in America, the Netherlands, Belgium, Russia, and Austria do not confirm the belief of those writers. The lighter soils of Ward and Ramsey counties, North Dakota, equal or excel the most fertile soils of the North-west in flax-seed production; and the light, sandy, very poor forest or scrub lands of some of the flax districts of Russia easily produce the finest types of fibre flax when the system of culture is at all intelligent. Indeed, in Russia, the writer found the peasantry continuing the culture of flax upon soils naturally light, and so impoverished from the long-continued ruinous "three-crop" rotation that the growing of oats and rye was no longer a possible consideration. This was a surprising confirmation of previous conclusions drawn from work done at the North Dakota Agricultural Experiment Station. It has also been shown in this work that the flax plant is less radical in its draft upon the soil than wheat, corn, or oats.

Experiments conducted by the North Dakota Station on large plots definitely illustrate that flax is not particularly hard on the soil. In the Red River Valley it has often been found that the soil is too fertile for the growth of a flax crop when atmospheric and soil moisture is normal. The farmers of the valley often put flax upon summer-fallowed lands, thinking that such lands are too strong for the wheat crop. Observations of this practice have shown that very often the flax crop almost fails, and produces a poorer yield of seed because of this extra fertility. In droughty seasons the flax crop has shown itself able to stand on very fertile lands, but frequently it is almost worthless when anything more than an ordinary rainfall occurs. It has also been very clearly demonstrated at the North Dakota Station that considerably better crops of wheat may be raised after flax than after wheat.

By comparing soil statistics, contrasting the chemical composition of farm crops, and considering extremely various types of soil upon which fine crops of flax fibre and flax-seed have been grown, it has been made evident that flax-growing is not injurious to the soil. The chemical analyses of the soils

of some of the noted Russian flax-producing districts bear out this statement. The lesson for American farmers is that, so far as flax is concerned, soil quality is rather a secondary consideration. The strains of seed used and the climatic and atmospheric conditions seem to be first in order of importance.

Growth-periods of the Crop.

The flax plant of cultivation is naturally an annual, and is, therefore, limited to climatic and soil conditions which are suited to the growth of such plants. In certain southern regions, including southern France, it is sometimes cultivated as a winter annual, but such varieties are found to mature when sown as spring crops in the usual flax-growing regions. The complete growth-period varies somewhat according to the types or varieties, and quite considerably according to the climate and region in which the crop is grown. Flax may, however, be looked upon as a short-season crop. It is quite common for the seed crop to be matured in from two and one-half to three months. This makes it a very important crop for northern regions. Indeed, the fibre crop, as has been previously noted, may be produced in very fine form in regions so far northward that few other crops may be successfully matured.

The entire growth-periods of the plant may, for convenience, be divided into (1) the period immediately following seed germination, and preceding the development of the regular foliage leaves; (2) the period from the seed-leaf stage to the blossoming stage; (3) the period of flowering and boll formation; and (4) the period of maturing. Very much depends upon the condition of weather and soil during these definite periods of growth as to the final types of the products; and much depends also upon whether one is growing the crop for the production of fibre or seed, what sort of weather should be hoped for, and what soil conditions one should strive to maintain. Generally speaking, a halting, irregular growth will result in the formation of a woody straw and a poor type of fibre product. There may or may not be a good seed crop produced under these conditions. If the aim is to produce a long even growth of fine fibre, everything possible should be done to obtain an even and rather slow growth. Arrangements should be made to provide that texture and drainage of the soil which will give as constant a water supply as possible. Anything which checks the growth of the straw during the period preceding boll formation is sure to result in an inferior type of fibre. If a drought sets in at some time when the straw should be making its greatest strides in length and increase of diameter, there will be a formation of woody straw and a thickening and hardening of the fibre cells, and the straw becomes contracted, stunted, and brittle.

Where the crop is being grown for seed purposes, the matter of an even growth is almost of equal importance. It is extremely important to the seed crop that the atmospheric conditions should be sufficiently dry to cause the sturdy woody type of stem growth and a heavy production of foliage, for the reason that seed production demands a strong branching plant-body with large leaf surfaces. In order that the boll formation may be numerous and

perfect and the seeds may be well filled, large leaf surfaces expanded to the sun and air are a necessity, as these are the manufacturing source of the seed content. Too much moisture throughout the growth season results in weak and imperfect stems and poor boll and seed formation. If a severe drought should occur at or near the time of flowering or boll and seed formation, it will prevent the proper flow of sap and occasion the hardening and ripening of the straw, especially of the slender and thin stems upon which the bolls are formed, thus cutting off the proper supply of food materials from the seeds. Every effort should, therefore, be made to provide a type of soil which will maintain to the last a sufficient supply of moisture. The flax plant when supplied with a subsoil moisture will stand very severe conditions of atmospheric heat and drought.

A period of extreme importance in the growth of the crop is that which immediately follows seed germination. It is of the utmost importance that the germination should be rapid and that the soil should be in such condition as to allow the seedlings to come immediately above the surface. This accounts for the great care which should be exercised in the preparation of the soil for the seed-bed, as described later.

Cultural Methods.

The matter of formulating some systematic methods of flax culture which shall be recognised as of special merit is of first importance when considering the question of establishing the crop as a staple one in any particular region. In America there is a great difference of opinion as to what methods should best be pursued in preparing the seed-bed, sowing the seed, and harvesting the product. Generally, the crop is looked upon as a side issue, and is cared for without much uniformity of effort and method. Even in the old flax-producing regions of Europe the writer found that definite knowledge as to the best methods of handling the soil and seed is hardly to be had except from observation. A great diversity of belief was found to exist. The processes generally followed and the methods which may be calculated to give the most satisfactory results are outlined in the following pages.

The Seed.

The most successful flax-growers place great stress upon the care with which the seed is handled, and upon the type and character of seed which is used; but it is a peculiar, indeed, a strange feature of the entire system of flax culture that no matter what region is visited one finds that the producer of the crop believes he should send to some distant region to procure seed. It is evident that this belief alone would result in a very thorough mixing of all the kinds, types, or varieties, and at the same time it practically eliminates the idea of seed development or seed breeding.

The writer is convinced that the raising of properly-cared-for home-grown seed would be of great advantage to the entire fibre industry of the Netherlands. This statement is made here in order to impress upon the American flax-producer the fact that, if it is to be hoped ever to make the crop reach a

standard of excellence, he must cease to buy seed of unknown quality, and must proceed to grow the crop from seed of known pedigree. Experiments with farm crops have for a number of years shown that crops in their climatic environment do not degenerate by being grown for a long time upon the same type of soil. The cause of weakening depends upon other features which are not properly considered. The Dutch grower persists in sowing the seed thick upon the ground in order to give the fine type of fibre-straw. He also pulls the straw while yet somewhat immature, that he may procure what he considers the best grade of fibre. The result is that each year the seed becomes weaker and weaker. Those who are in the business of growing fibre flax can well afford to set aside a piece of ground in order to produce a sufficient quantity of thoroughly matured seed of a pure type with which to seed their lands.

The quantity of seed sown to the acre throughout each particular flax-growing region is fairly uniform. The Russian growers, who sow the crop for oil-production, approximate very closely one-half bushel of good seed per acre. The Dutch, Belgian, and Russian growers of fibre flax sow very uniformly 8 to 10 pecks of seed per acre, according to the strength of the land and the moisture conditions which the crop can stand. The Russian seed costs Hollanders approximately from $2·50 to $4 per acre, because, before sowing, great care is taken to grade out everything but the very plumpest and best seeds.

Because of its capability of absorbing water and of its oil content, flax seed is of such a nature as to readily lose its viability. It is particularly susceptible to injury by heating in the bin, by exposure to high dry-storage temperatures, or by exposure to slight amounts of moisture under conditions of low temperature. As the young plants are very susceptible to the action of moulds and other fungi which attack the seedlings and the mother seeds at the time of germination, it is of great importance that the seed should be stored dry, so that the spores of such fungi cannot gain a hold upon the seed. Flax seed for sowing purposes should, therefore, be harvested dry and stored in a cool dry place.

The Land

In America flax-growers make little distinction as to what type of soil they select on which to grow the crop. Speaking generally, the farmers of the Netherlands, Belgium, Germany, and Russia follow the same course. The writer's observations show that the kinds of soil upon which the crop reaches the standard of perfection are very uniform in all regions, though fair crops may be raised upon soils of a great diversity of types.

For the fibre crop the texture of the upper layers of soil should be such as to give a finely-compact surface, well drained, but of sufficiently sandy and loamy nature to allow the first growths of the root system of the young plant to be rapid; and yet it should not be so loose as to cause rapid drying, or so compact as to cause baking and cracking. A feature of the greatest importance is that there should be a heavy, rather compact subsoil, capable of

persistent retention of moisture. The best types of the fibre crop of the Netherlands and of Russia were found upon soils which seemed to possess these general characteristics with a fine admixture of sea-sand, giving a type of surface which could stand a large amount of water without baking and cracking during periods of partial drought.

As previously indicated, the matter of fertility seems to be of minor importance. The flax crop can be grown upon a soil so poor in the chemical elements needed for plant nutrition that scarcely any other crop could succeed, provided the other and more important conditions are favourable. In hot, dry regions, where the crop is more commonly grown for seed, the features of the soil which are of extreme importance are those which ensure a shallow but compact seed-bed, a rapid first growth, and a steady water supply from a heavy underlying subsoil. While good crops of seed flax may be grown upon light lands with a gravel subsoil, this can only be expected in years when the season of boll formation has an abundance of rainfall or receives its equivalent by irrigation.

As to the application of manures and fertilisers, the growers in the Netherlands do not recommend barnyard manure upon lands which are to be used for the production of fibre flax. They claim that this fertiliser produces too much wood in the straw, and thickens the fibre. Many of the growers who have to deal with lands of light quality that need pushing, apply a light top-dressing of saltpetre at about the blossoming period. This is said to lengthen the growth period and to soften and lengthen the straw. The application of properly composted barnyard manures to the crop which is being grown for seed purposes cannot be condemned, as the strong, woody stem in this case is of material benefit in seed production.

The Seed-bed.

Great stress is usually placed by English writers on flax culture upon the idea of deep working the soil in preparing the seed-bed. The writer's work has shown that this idea is correct where compactness of soil is provided; but those who contend for a loosening and softening of the seed-bed seem to be wholly in the wrong. The one thing that a flax crop cannot stand is a friable, loose-textured soil. The best flax soils are found to be those with an admixture of very fine sea-sand or silt resting upon a heavy compact subsoil. Where the better crops of Belgium, the Netherlands, and north-west Russia are seen growing, the topsoil, with its fine admixture of sand, soon after preparation becomes very compact, save only a slight blanket of surface-sand which, worked to the top by means of rain, acts as a mulch or blanket to prevent cracking and baking in period of slight drought.

The character of the soil naturally determines the time for working and ploughing; but usually fall ploughing is apt to give the best results in all those types of soil which tend to become more compact by working. In all cases in which the soils after deep ploughing become more thoroughly compact by harrowing or top-working, much harrowing is desirable. In very rich, loamy soils, which are liable to become loose and friable by persistent

working, the top-working should be confined to the destruction of weeds, and should be stopped at the slightest sign that overwork is tending to looseness, liability to blow, &c.

The aim is to provide a well-worked undersoil, so as to give it a close texture and continuity for the ascent of water, and at the same time to provide such surface-working as to give a fine, shallow seed-bed. Regardless of traditional theories, observations show that a compact soil underlying a shallow seed-bed of not to exceed 1 inch in depth always gives the best results. The deep ploughing and working should precede the seeding time just as long as possible, as its value consists in a proper aeration of the underlying soil for the preparation of food materials for the coming crop.

Seeding Time.

The Rev. J. Lintott Taylor states that in the Orange district of New South Wales the most suitable time for sowing linseed is in the months of March and April. The date varies according to the latitude and climatic features. The rather cool, rapid-growth months of spring and early summer tend to produce long and fine types of fibre. The fibre plant cannot withstand the hardening influence of the high dry heat of the late summer months.

Seeding Methods.

The methods of seeding for flax are as various as the people who grow the crop. The larger areas of the Netherlands and Belgium are seeded with ordinary grain-drills, and such machinery is also used upon the largest estates in Russia, where the crop is grown for oil production. Small areas in all countries are seeded by hand broadcast and harrowed in. Russian peasants broadcast by hand almost exclusively. If evenly cast, it is supposed that all straws are shaded alike, and therefore mature evenly as to fibre.

The chief merits of any method of seeding must depend upon three points: The seed should be embedded at an even depth—not too deeply—and should be evenly distributed. The brush harrow, as commonly made by American farmers, gives good results when properly handled; but no scheme of broadcast seeding can give the regularity of depth that yields best results with this crop.

Considering entire crops, the best ones are quite the most apt to follow the drill. Regularity of depth in seeding is of the utmost importance with flax, whether planted for oil or for fibre purposes. If the seeds are buried at different depths there is very great irregularity of first growth, resulting in unequal maturing. With the fibre crop evenness of growth and maturing of the straw is of first importance.

Crop Rotation.

With the flax-grower, crop rotation is of great practical importance. He must either rotate or cease to grow the crop. An effort to learn the best possible system of rotation for flax resulted in showing that among growers there is much confusion of ideas.

Only one fact was characteristic of all replies obtained, viz., that there should be as long a period of years intervening between flax crops as possible. Most growers in the Netherlands and Belgium hold that the chief necessity for long series of crops in the rotations is due to the destructive action of flax-wilt, but they also believe in the process as one that is essential to general agriculture. Of the best producers of fibre flax, few believe in less than seven year series. Many recommend much longer rotation periods and favour the introduction of grass and pasture in the series of crops. A very common rotation in the Netherlands is as follows:—(1) Manure or rape; (2) wheat; (3) rye; (4) legumes (horse beans); (5) flax; (6) potatoes; (7) potatoes; and (8) fallow-rest, and crop of weeds turned under as a green manure late in the season. If the soil is very fertile, the potatoes follow the legumes preceding the flax.

In Russia the peasants, according to the compulsory customs of the particular commune, practice either three or six year rotations. In the better flax-producing villages the rule is usually for a six-year rotation, as follows:—(1 and 2) wheat; (3 oats; (4) rye; (5) pasture; (6) flax. In many districts the common rotation is:—(1) fallow; (2) wheat, rye, oats, or barley; (3) pasture for the village cattle; and then flax year after year until the soil is practically robbed of the strength necessary to support even grass.

In the northern regions of Russia, a scrub and timber country, where the population is sparse, great crops of fibre flax are grown by "land rest" method. After each flax crop, the peasant allows the land to run wild as a village pasture, and to grow up to scrub timber for ten or fifteen years. The scrub is then burned off and the breaking is cropped to flax. By this wasteful method they grow undoubtedly the best fibre straw known. The land cleared in this way seems to have all the advantages of virgin soil.

The feature most widely observed is that on light soils a leguminous crop is of much benefit in preparing the soil for flax culture. If, however, the soil naturally possesses much available nitrogen, the flax is sown so long after the leguminous crop as possible, and is usually preceded by grass or hay crops. The most common procedure in all countries seems to be the placing of flax in the series after several years of grass and pasture. This seems important when freedom from the destructive action of wilt is considered. During the writer's investigations, however, no grower was found who believed that any sort of rotation series could serve as a complete specific against the occurrence of flax-sick soil. It is also self-evident that no rotation can be given which will fit all soils and regions.

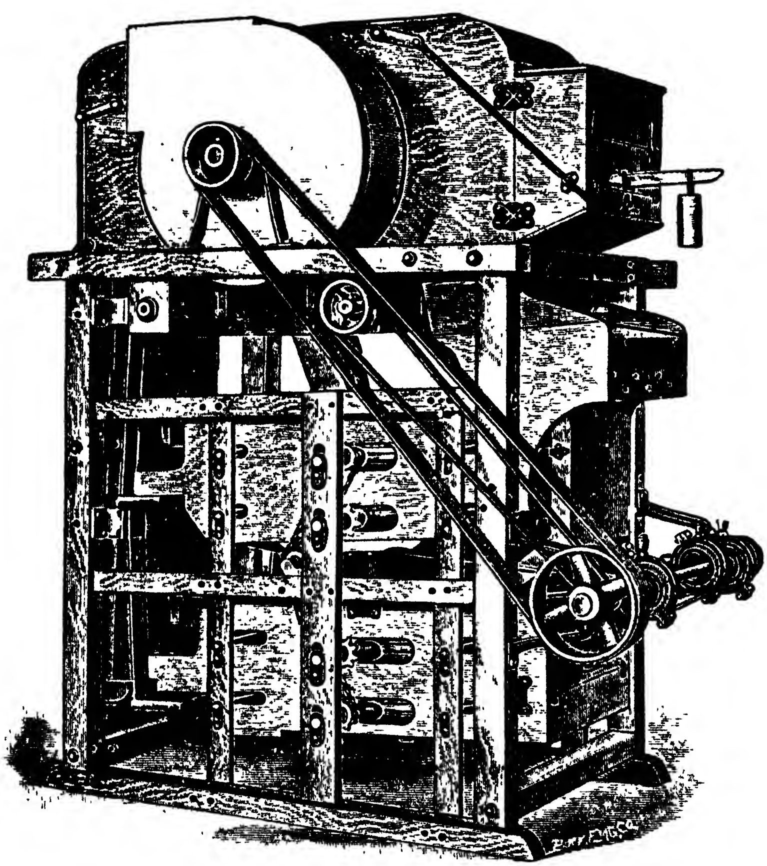
Control of Weeds.

Very little need be said of weeds. It is not supposed that they should be allowed in any carefully grown crop; yet there is probably no crop in which their presence is more pernicious than in flax culture. In the case of fibre crop they must all be removed from the straw by hand before retting, a very costly process. Their presence in the crop also causes unevenness of growth and maturing, with associated evils. In the seed crop they occasion

by their extra foliage great difficulty in properly drying and curing the seed-bolls for thrashing. The greatest difficulty is also experienced in attempting to grade weed seed from flax seed; and whether the seed is being purchased for oil or for sowing purposes, there must be a loss to the grower on account of the low price obtainable for such inferior seed.

Harvesting the Seed.

Whether the seed is to be used for sowing purposes or for oil, great care is necessary in the harvesting process in order to hold the quality of the seed. The essentials are that the seed should be allowed to mature, be harvested dry,



Flax seed cleaner and separator.

and be kept in a dry condition. Since there are no growers who practise growing fibre flax for seed purposes, it is easy to account for the fact that even the best which is to be had is of very uneven grade. In Russia the seed is sown so thick that only two or three of the topmost bolls are able to mature. When the crop is pulled the other bolls furnish weak, half mature, scaly seeds. No Russian peasant grows any great quantity of seed, and before it reaches a seedsman many different lots are mingled.

Pulling.

Everywhere the pulling of the straw is done by hand. The arguments for this practice are always essentially the same, viz., (1) that there is no machine which will do the work well, and (2) that it is wise to pull by hand, as all weeds may be discarded, and the crop may be sorted and thrown into proper grades of straw. Some writers claim that there is much loss of fibre if one attempts to cut the crop, for the reason that " the best fibre is located in the lower stem and root." There is little or no foundation for this belief. The last 2 or 3 inches of stem is exceedingly woody, and contains but little fibre, and the root contains no fibre of value. At some of the large scutching mills in Belgium, it was contended that the fibre from cut straw is unsatisfactory for spinning purposes, for the reason that fibres with cut ends do not bind together in the thread properly, that they slip, &c. There may be some basis for this belief, but it seems very doubtful that it can be a feature of any great importance. The principal reasons for pulling instead of cutting flax seem to be—(1) to avoid stain and injury, which would result from soil moisture soaking into the cut stems while curing in the shock; (2) to secure better curing of the straw and ripening of the seed; (3) to secure straw of full length. Pulled flax commands a price of from $1 to $2 per ton more than cut flax.

Clean culture would eliminate the weeds, and the seed-bed which is best suited to flax culture is of so even and smooth a nature when properly prepared that reaping machines could be set to run so close to the earth as to remove practically every inch of valuable straw. There is no successful pulling machine now in use, though its invention has been attempted.

Thrashing, or Seed Removal.

In European fibre work the seed is always removed by hand, or such simple machinery is used that hand labour is the main element. The attempt is to save the fibre in the small branches upon which the bolls are located. Much care is given to the proper drying of the straw and seed-bolls or capsules, so that the work of seed removal may be as easily effected as possible. The crop is sometimes left in small bundles or swaths as pulled, and then dried and stacked. Sometimes it is kiln-dried, or often in peasant districts hung in bunches upon fences or on racks put up for that purpose.

European growers of fibre flax contend that the proper saving of the seed-crop should give sufficient seed to pay for all of the farming processes—indeed, all of the steps in the culture of the crop up to and including the process of retting.

Retting.

The process of freeing the fibre from the woody and gummy substances, so that it can be easily removed by the processes of breaking and scutching, is known as retting. The work may be done either by chemical means or by the slower process of fermentation or rotting. The retting may be done in water or by a weathering process through exposure to dew, rain, and sun.

The latter method is also one essentially of fermentation. The great mass of flax fibre of the world is produced by the natural fermentation method. Up to the present, chemical methods have been found too costly, and the quality of fibre produced has not been satisfactory. Some very pretty types of fibre have at times been freed by chemical means, but large plants for such work are not as yet successful. The various chemical methods used up to the present time result in bleached fibres, to which the trade is unaccustomed, preferring the raw fibre colour. Nearly all of the flax fibre thus far produced by chemical methods feels harsh, and lacks the strength and durability of either the dew-retted or water-retted flax.

In some of the fibre districts of Russia the peasants use a combination of shallow pool and dew retting. They commence the work in the fall as soon as the seed can be removed, wetting the straw once by immersion in some shallow pool for a period of one to three weeks, weighting it down by the use of logs or stones. The straw is then removed direct to some grassy meadow and spread in thin swathes for drying and dew retting. The chief reason for the dark colour of the great bulk of the raw fibre produced by the Russian peasantry is the carelessness with which they carry out their processes, as they often allow the straw to remain either too long in the pool or too long on the grass, letting it rot rather than ret.

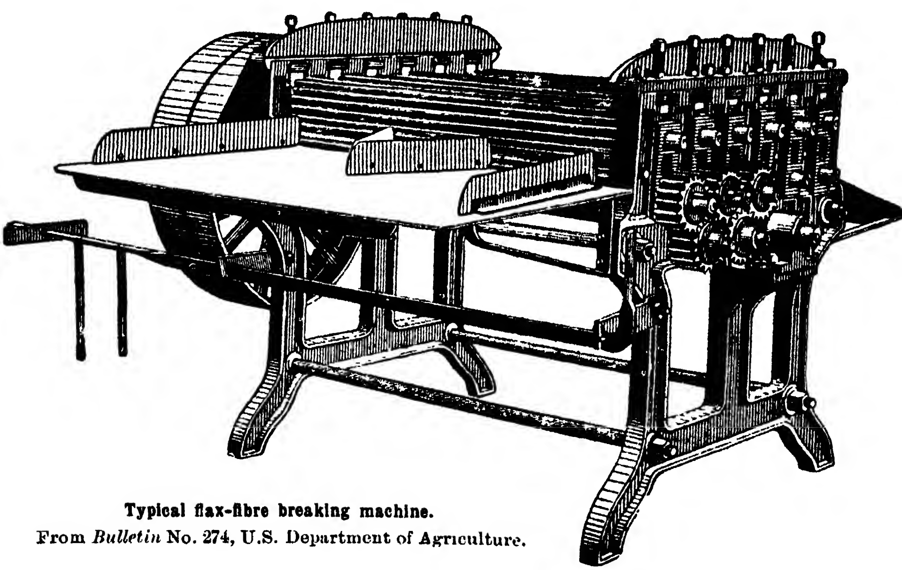
Another process seen in practice in Russia was a modified pool or pit method. It is there referred to as American, the natives stating that it was introduced by a very bright American. This belief, however, could not be confirmed. Very fine results are obtained by this method. The straw is stacked until May, and is then immersed in deep pits or pools encased in heavy planking or logs capable of holding many tons of straw in bundles. The retting processes are continued through the summer months. In an instance seen by the writer, the pits were placed upon a hillside in such a manner that the water from the spring above was allowed to pass through a series of pipes from one pit to another; and, as there is an automatic arrangement governing the inflow and outflow of the water, the temperature of the fermenting straw and surrounding water can there be kept at a very regular point. When the straw is first put in and the water is turned on, the temperature rapidly rises, but it is not allowed to go above, approximately, 110° F.

An outline of this process may be indicated by the following steps:—(1) The bundles of straw are placed in the pit and wet up for a period of twenty-six hours; (2) the water is then turned off and the mass of straw is allowed to heat for thirty-six to forty-eight hours, care being taken that the temperature does not rise above 110° F.; (3) the water is turned on again for sufficient refreshing to keep the temperature down, the straw being allowed to remain from one to three weeks, according to the progress of retting; (4) the straw is next spread out in swathes upon the grass to dry and dew ret for a period ranging from one to three weeks, according to the conditions observed; (5) after proper drying the straw is placed in bundles and stacked dry.

Breaking and Scutching.

After it is retted, the straw should be bright, thoroughly dry, and have a rather sweet odour. At Courtrai, Belgium, the straw, after being retted, is dried and stacked, and remains in the stacks until the close of the retting season, when the breaking and scutching operations commence. As the wood, skin, or bark parts are harsh and brittle and the fibre elastic and tough, the straw is broken or crushed in such a manner as to cause the wood to drop away from the fibre masses. This process is called breaking The straw may either be crushed by pounding with mallets or crimped in some sort of breaking machine.

Although the breaking and scutching may be well done by machinery, yet, at best, much hand labour is needed in order to keep the fibre properly bunched, graded, and free from snarls. That which becomes much snarled must be disposed of as tow. The usual machine-break in Europe consists of



Typical flax-fibre breaking machine.
From *Bulletin* No. 274, U.S. Department of Agriculture.

pairs of horizontally-placed fluted or corrugated rollers, through which the retted straw is passed endwise. There are usually from six to twelve pairs of such rollers, so adjusted that each pair crimps somewhat more closely and fits more tightly than the preceding pair. Flax-breaking machines used in America usually consist of five corrugated rollers, arranged so as to give an interrupted or retrograde movement.

The scutching is done by means of flattened paddles. If done by hand, a bunch of broken fibre is held tightly in one hand, while a glancing stroke is made with a thin, smooth paddle, the process being continued until all of the coarse bits of broken wood are removed. In the regular scutching mills the work is done by a set of revolving paddles, while the fibre is held in the hand of the operator in such a manner that the paddles strike it a glancing blow as it rests over a rounded, smooth-edged board with slanted sides or

edges, the ends of the bunch of fibre being reversed from time to time during the process.

In a properly arranged scutching mill there is a series of stalls for the operators, in each of which the scutch wheels revolve upon a power shaft.

A Belgian scutching mill, showing the position of the operator with reference to the scutching wheels and sorting stalls.

From *Bulletin* No. 274, U.S. Department of Agriculture.

There are twelve paddles to the wheel, and the wheels revolve at the rate of 150 revolutions per minute. The paddles thus strike regularly upon the fibre at the rate of 1,800 times per minute. Because of this regularity of action

the operator is able to judge to a nicety the progress and finish of the work. As it is exceedingly dusty work, ventilation stacks are provided with hoods covering each wheel, and an air blast carries off all dust and light matter. In Belgium it is a common practice to divide the scutching process into two or three periods, placing the fibre in cold storage during the rest period between the scutchings. This method of work is said to give flexibility and "life" to the fibre.

Sorting, Baling, and Grading.

The scutching process results in cleaning the fibre of all the woody matter, and while this is being accomplished the operator throws the flax into separate piles, according to his judgment of quality. It is then tied into small bundles and finally baled, each bale being supposed to contain fibre of equal quality as to market value. It is baled under pressure into small bundles approximating 200 lb. The best qualities of fibre are usually encased in covers of coarse gunny sacking, and each bale is marked to indicate its grade or quality before it is allowed to be placed on the market. This is done in the large warerooms by opening the bales sufficiently to draw samples of the fibre.

The writer often saw the process of grading in operation. In the Netherlands the tests applied are such as can only be made by those who have had long association with fibre work. It was observed that in all types of the finest fibre grades the fibre strands were perfectly free from woody or extraneous matter and entanglement. The best types were usually of a pale-grey colour, shading slightly to a light golden-greenish cast. If too raw or green in colour, the fibre may represent an insufficient retting and degumming. If too white, it is found to have lost pliability, life, and perhaps strength. Very dark-grey types of fibre, such as is usually sold by the Russian peasantry, represent undue retting and exposure to weather, whereby much strength and pliability are lost before the process of artificial bleaching may bring the fibre back to a usable form.

Flax Diseases.

The flax crop gives a fair yield upon new land, but if allowed to follow itself year after year soon ceases to be profitable,—for the crop dies away to such an extent that there is not sufficient stand left to pay for the work. The soil is then said to be "flax-sick" or "exhausted" for flax culture. It has been demonstrated at the North Dakota Agricultural Experiment Station that the trouble is not primarily with the soil,—that the soil is not chemically exhausted, but that the trouble is due rather to the presence in the soil of micro-organisms.

Varieties of Field Flax.

Considerable attention has been given by the writer to the question of the existence of fixed varieties within the species known as *Linum usitatissimum*, the common field flax. Most practical growers throughout Europe, and especially in Russia, contend that there are no absolutely fixed varieties. Numerous observations made in the different countries, however, concerning

single forms, have convinced the writer that there are several well-marked varieties of cultivated field flax. Among these there are at least two which should be classed as species, namely, *Linum usitatissimum, L.*, including all of the small-seeded varieties, and *Linum humile*, Mill, including the large-seeded varieties. Of the first-named species, the following varieties may be listed :—(1) common blue-flowered fibre flax ; (2) common blue-flowered seed flax ; (3) dehiscent-boll seed flax ; (4) common white-flowered fibre flax ; and (5) white-flowered white-seeded flax.

Of the big-seeded Sicilian species, *Linum humile*, the following types may be noted :—(1) Sicilian big-seeded, blue-flowered seed flax, sometimes grown as a winter variety ; (2) big-seeded, white-flowered, white-seeded flax ; and (3) Indian seed flax, Egyptian seed flax, and Argentine seed flax. The latter are large-seeded varieties of a character almost midway between the Sicilian big-seeded flax and the common Russian seed flax. Each has some qualities distinguishing it more or less definitely.

There seem to be many intermediate grades or strains between the two species mentioned, and within the various varieties named. Because the crop has always been grown without much care as to purity or variety, there have been much intermingling and mixing, possibly cross-breeding ; and it is a matter worthy of experiment to determine, just now, how far the so-called "running out" of varieties is due to cross-breeding, and how much is due to mixing, from careless handling of the seed. Studies conducted upon the varieties of these two species of cultivated flax tend to indicate that they are usually close fertilised. Individual flowers, for example, produce seed freely, whether in association with other flowers or not. The structure of the flowers, while possibly allowing cross-fertilisation, is such as to indicate that they do not usually cross-fertilise to any great extent. It is the opinion of the writer that practically all cases in which the different varieties are reported as "running out" may be traced to careless seed handling and mixing, whereby the common type characteristic of a particular region soon predominates over the imported strain.

In the *Public Ledger*, London, of November 30th, 1907, the current price of various fibres are quoted as follows :—

	£	s.	d.		£	s.	d.
Aloe, per ton	11	0	0	to	28	0	0
China Grass, per ton	25	0	0	,,	33	0	0
,, Jute, ,,	15	0	0	,,	17	10	0
Mexican	23	0	0	,,	30	0	0
Raffia	22	0	0	,,	27	0	0
Hemp, per ton, c.i.f.—							
Polish	36	0	0	,,	37	10	0
Italian	41	10	0	,,	42	10	0
Sunn	12	0	0	,,	25	0	0
Other East Indian	12	0	0	,,	20	0	0
Manila, brown	23	0	0	,,	26	10	0
,, fair	28	5	0	,,	28	10	0
,, good	32	0	0	,,	35	0	0
Mauritius	22	0	0	,,	28	0	0
New Zealand	24	0	0	,,	32	0	0
Sisal	9	0	0	,,	29	0	0

The *Textile Mercury*, December 21, 1907, quotes flax as follows :—Bejetsky, £36 10s.; Javapol, £26 to £27 ; best Livonian, £20 ; Courish, £18 to £19 ; and Hoffs, £15 10s. to £16.

Yield of Seed.

The yield of flax seed in the American States averages about 10 bushels to the acre.

Yield of Fibre.

In Ireland the average yield per acre of flax for the years 1896 to 1905, was 448 lb.; in 1906 the yield was estimated to be 485 lb.

The cost of growing and pulling of flax fibre at the Oregon Station was \$15 15c. (£3 3s. 1½d.); and for ploughing, harrowing, and sowing, \$7 70c. (£1 12s. 1d.)

In America, the price for flax seed varies from 85 cents (3s. 6½d.) to \$1 50c. (5s. 3d.)

Allowing 56 lb. of seed per bushel, and taking the general average of yield of flax seed in the United States at 10 bushels per acre, *i.e.*, 5 cwt., and allowing, say, 5s. per bushel as the price obtainable by the farmer here, £2 10s. per acre is realised for the seed, and taking the average yield of fibre, as obtained in Ireland, at, say, 4 cwt. at a low price of, say, 16s., per cwt, the return from fibre will be £3 4s. per acre, making a total of £5 14s per acre. If the fibre, however, is of better quality it may bring £30 or £36, or even more, per ton, say, 30s. per cwt; the total yield will then be £8 10s. per acre, *i.e.* 50s. for seed and 120s. for fibre.

On the other hand, the yield of seed may reach, say, 14 bushels per acre, which at 5s per bushel equals £3 10s. for seed, and if in such circumstances 4 cwt. of fibre can also be obtained at the lower price of 16s. per cwt, then the total yield for the crop equals £6 14s. per acre, *i.e*, 70s for seed and 64s. for fibre.

The farmer may, however, be growing a thickly-sown crop for fibre only, and under such circumstances supposing that 5 cwt. of fibre is obtained, worth, say, 40s. per cwt., then the yield is £10 per acre from fibre only, and there will be some seed saved as well.

Fair to first-class flax evidently brings good prices, and in making an estimate at the price of only £16 per ton, it must be borne in mind the above returns are perhaps too low, and £20 to £30 and even £40 per ton may at times be obtained for really excellent fibre.

There is some variation in the weight per bushel of flax seed; some seed will go up to 60 lb. per bushel or over. In Ireland the seed is sold by the barrel or by the stone, and it is hardly advisable to form estimates on a price per bushel unless the weight of that bushel is made known in the first instance; consequently, I have taken the weight at 56 lb., being a half cwt.

At the present time linseed from Calcutta for crushing purposes for fodder, &c., may be purchased at about 14s. per cwt., which is equal to 7s. per bushel of 56 lb. The seed locally grown would compete against the imported article, and while the above estimated price of 5s. per bushel in the examples of estimated results may be low, I am probably safe in saying there is that margin, as between the 5s. I have allowed as the price per bushel to the farmer, and the value of Calcutta seed at the time of writing, namely, 7s. per bushel of 56 lb

List of Fertilisers in New South Wales.

F. B. GUTHRIE AND L. COHEN.

1908 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, and their values, is the result of the revision of the list issued in April, 1907.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

A word is necessary in explanation of the column giving the "values" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values here given are computed are as follow :—

UNIT-VALUES of fertilising ingredients in different manures for 1908.

	Per unit. s.	d.
Nitrogen in nitrates	15	7
,, in ammonium salts	13	9
,, in blood, bones, offal, &c.—fine	15	0
Phosphoric acid in bones, offal, &c.—fine	3	0
Potash in sulphate of potash	5	2
Potash in muriate of potash	4	8
Phosphoric acid in superphosphate and mineral phosphate—		
Water-soluble	5	2
Insoluble	2	9

PRICE per lb. of fertilising ingredients in different manures for 1908.

	Pence per lb.
Nitrogen in nitrates	8·3
,, in ammonium salts	7·4
,, in blood, bones, offal, &c.—fine	8·0
Phosphoric acid in bones, offal, &c.—fine	1·6
Potash in sulphate of potash	2·8
Potash in muriate of potash	2·5
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble	2·8
Insoluble	1·5

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result

being the value per ton of that substance in the manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4 x 15s. 0d.	=	£3 0s. 0d.	= value of the nitrogen per ton.
20 x 3s. 0d.	=	£3 0s. 0d.	= value of the phosphoric acid per ton.
		£6 0s. 0d.	= value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions. Neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked in all cases by analyses made on samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood, and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

A word may be added in explanation of the term water-soluble phosphoric acid. When bones or mineral phosphates are acted on by sulphuric acid, a

portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bi-calcic phosphate. This is known as 'reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

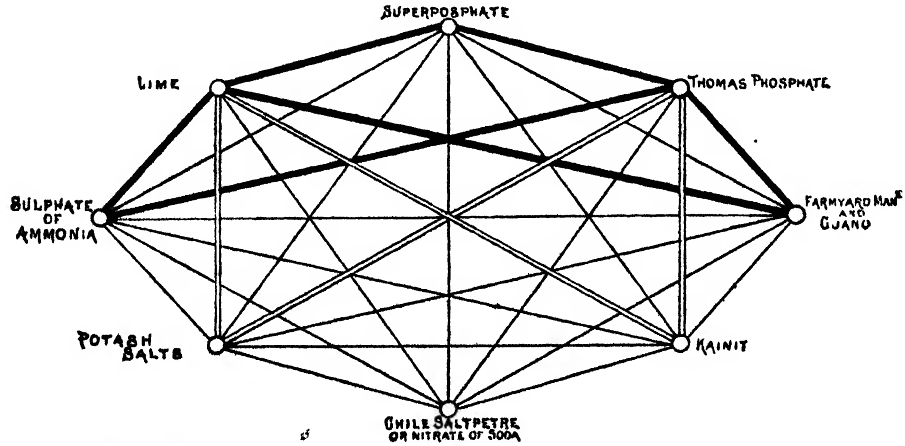
In the fourth table are a number of waste products which may in many cases be economically utilised.

WHEN purchasing a manure always insist on a guarantee of its composition as determined by analysis.

Artificial manures should be mixed with about three times their weight of dry loam, and distributed evenly.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures. The diagram originates with Dr. Geekens, Alzey, Germany, and is taken from an article by Mr. Leo. Buring in the *Garden and Field* of 10th October, 1903.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

D

I.—Simple Fertilisers.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Equivalent to Ammonia.	Lime (CaO.)	Potash (K_2O.)	Phosphoric Acid (P_2O_5).	Manurial Value. £ s. d.
Sulphate of Ammonia...	Australian Gaslight Co., Kent-street, and any manure merchant.	20·40	24·77	......	......	......	14 0 6
Nitrate of Soda...	Gibbs, Bright, & Co., 37, Pitt-street, and any manure merchant.	15·90	19·30	......	......	.....	12 7 7
,, ,, ...	"K.P.N." Fertiliser Co., 12, Spring-street ...	10·30	12·51	.....	.....	......	8 0 5
Kainit	Potash Syndicate, and any manure merchant .	.....	....	......	12·5	....	3 4 7
Muriate of Potash	,, ,, ..	.....	.....	......	60·0	......	14 0 0
Sulphate of Potash	,, ,, ..	...	....	......	52·0	.....	13 10 0
30% Potash Manure	,, ,, ...	..	......	......	30·0	.....	7 0 0
Thomas' Phosphate	A. H. Hasell & Co., 2, Bridge-street	...	.....	......	......	18·0	....
,, ,, ...	"K.P.N." Fertiliser Co., 12, Spring-street ..	......	....	......	.....	17·20	....
Building Lime*	Sydney and North Sydney Lime and Cement Co., 17, Pitt-street.	......	.....	95· (about)	......	......	....
Agricultural Lime*	,, ,, ...	......	.....	60· (about)	......	......	....
Gypsum Fertiliser*	A. H. Hasell, & Co., 2, Bridge-street	......	......	98· crystallised $CaSo_4$	......	......	....

* Lime and Gypsum not guaranteed.

II.—Bone and Blood Manures.

Manure	Where obtainable.	Guaranteed Composition. Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	Manurial Value. £ s. d.
Special fertiliser, No. 3	Co-operative Wholesale Society, Alexandria	5·0	6·07	18·3	40·0	6 9 11
Dried blood	Waratah Fertiliser Co., Ida-street, Waratah	11·5	13·96	....	......	8 12 6
Bone-dust	,, ,, ,, ,,	4·12	5·00	22·9	50·0	6 10 6
Dried blood	Colonial Fertilisers Co., 117, Pitt-street	10·7	13·00	......	......	8 0 6
Bone-dust, B.D. 2	Paton, Burns, & Co., corner of Sussex and King Streets.	3·7	4·49	22·12	48·29	6 1 0
,, B.D. 3	,, ,, ,, ,,	3·3	4·00	20·7	45·19	5 11 7
,, B.D. 4	,, ,, ,, ,,	3·3	4·00	18·4	40·17	5 4 8
Bone and blood, B.B.	,, ,, ,, ,,	5·35	6·50	11·91	26·0	5 16 0
Blood	,, ,, ,, ,,	10·7	13·00	......	.....	8 0 6
Bone and blood manure	R. S. Lamb & Co., 55, Pitt-street	5·76	7·00	13·74	30·0	6 7 7
A 1 bone-dust	,, ,, ,,	4·12	5·00	18·78	41·0	5 18 2
*** bone-dust	,, ,, ,,	3·91	4·75	23·82	52·0	6 10 1
Raw bone-dust	,, ,, ,,	3·91	4·75	23·82	52·0	6 10 1
Vulture manure	,, ,, ,,	3·09	3·75	18·32	40·0	5 1 3
Raw or green bone-dust	A. Wooster, Epping	4·01	4·86	24·41	53·30	6 13 5
Blood and bone-dust	,, ,,	5·76	7·00	13·74	30·0	6 7 2
Pure steamed bone-dust	,, ,,	3·91	4·75	24·50	53·5	6 12 2
Phosphatic bone-dust	,, ,,	3·30	4·00	21·18	46·25	5 13 0
Nitrogenous bone-dust	,, ,,	5·46	6·64	16·03	35·00	6 10 0
Blood and bone manure	A. H. Hasell & Co., 2, Bridge-street	5·5	6·68	18·0	39·29	6 16 6
Blood	,, ,,	12·36	15·00	.....	......	9 5 5
Blood and bone manure	Geo. Shirley & Co., Ltd., 81, Pitt-street	5·0	6·07	13·0	28·38	5 14 0
Blood	,, ,, ,, ,,	12·25	14·7	.....	......	9 3 9
Bone phosphate	,, ,, ,, ,,	·5	·61	29·8	65·0	4 16 11

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition. Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	Manurial Value. £ s. d.
Ohlendorff's Dissolved Peruvian Guano.	Gibbs, Bright, & Co., 37, Pitt-street ...	5 0	9·0	10·0	1·5	6 12 0
Superphosphate ...	"K.P.N." Fertiliser Co., 12, Spring-street ...	......	17·0	......	......	4 7 10
Superphosphate (concentrated).	" " " ...	......	41·9	......	......	10 16 6
Superphosphates A.1	Geo Shirley & Co, Ltd., 81, Pitt-street	......	18·78	......	......	4 17 0
Superphosphates No. 1	"	......	17·0	......	......	4 7 10
Superphosphates No. 3	"	3·3	13·0	......	2·0	6 2 10
Superphosphates No. 5	"	3·3	12·0	......	7·0	7 3 6
Superphosphates No. 7	"	1·6	11·4	......	1·0	4 6 1
Superphosphates No. 9	"	4·1	6·5	......	4·0	5 10 9
Superphosphates No. 11	"	......	11·4	......	7·0	4 15 1
A 1 Superphosphate ...	A. H. Hasell & Co., 2, Bridge-street ...	......	20·0	......	......	5 3 4
No. 1 Superphosphate ...	" " ...	......	18 0	......	......	4 13 0
Marion Guano ...	" " ...	......	......	27·48	......	3 15 7
Guano ...	Paton, Burns, & Co., corner of King and Sussex streets.	......	......	27·48	......	3 15 7
Special Potato Fertiliser...	A. Wooster, Epping ...	4·52	......	14·91	5·0	6 9 0
Complete Fertiliser ...	" " ...	5·01	......	14·56	2·0	5 19 2

IV.—Waste-Products, Ashes, &c., not on the Market

Manure.		Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value.
											£ s. d.
Deposit from wool-scouring tanks.	1	Liverpool Wool-scouring Works.	....	......	·64	·78	....	....	....	·72	0 12 6
„	2	„ „ „	....	....	1·02	1·24	....	....	·16	·39	0 16 5
„	3	„ „ „	....	....	1·37	1·66	....	....	·14	·20	1 0 2
Deposit from breakers		„ „ „	34·47		1·81	2·20	50·68	·85	·88	1·60	1 15 6
Sediment from wool-scouring works.		Yass	19·57		·59	71	78·24	·97	....	·20	0 9 1
Refuse from wool-scouring works		....	5·03	55·27	1·96	2·38	·65	37·81	·21	·12	....
Wool-waste		....	....	....	8 15	9·89	....	....	....	....	5 11 5
Scutch"		Australian Glue-Gelatin Works, Alexandria.	56·98	......	2·95	3·58	....	4·56	none	none	....
from limed pelts		Hugh Wright, Auburn	5·32	73·42	1·80	2·18	3·61	9·36	·89	·20	1 8 2
Decomposed hair and lime		Fellmongery	9·70	57·08	6·86	8·33	1·22	26·27	....	....	4 13 9
Tan-yard refuse		Tanneries, St. Mary's	6·43	33·83	2·24	2·72	21·43	26·96	·67	....	1 12 6
Peat		H. Tager, Moss Vale	72·93	16·68	·35	·42	10·39 (ash).	....	....	....	....
Filter-press muck		Cane-mills, Broadwater	16·39	26·07	·22	·27	34·86	13·20	5·98*	·44	1 12 10
Megass		Clarence River cane	22·86	67·32	·63	·75	8·61	·30	·01	·05	0 8 11
Megass-ash		„ „	......	....	....	......	87·69	3·07	·16	·51	0 3 1
„		Richmond „	....	....	....	......	......	1·11	·28	4·79	1 5 7
Bloodwood-ash		....	....	....	....	....	....	8·47	·27	5·25	1 7 11
Ironbark-ash		....	....	....	....	....	....	....	·82	1·53	0 10 3
Blackbutt-ash		....	....	....	....	....	....	7·27	·04	2·02	0 10 7
Red-gum-ash		....	....	....	....	....	....	....	·38	4·17	1 2 7
Spotted-gum-ash		....	....	....	....	....	....	....	·10	·70	0 3 11
Boxwood-ash		....	....	....	....	....	....	....	·67	1·65	0 10 5
Dried sea-weed		....	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14	....
Sea-weed-ash		....	....	....	....	....	....	9·27	·49	·59	0 4 5
„		....	....	....	....	....	....	6·29	1·27	17·55	4 14 3
„		....	·43	....	....	....	56·28	9·39	·47	2·26	....
Ash of grass-tree (*Xanthorrhœa arborea*).		....	0·86	1·78†	....	....	33·48	24·94	3·07	5·30	1 16 1
Vine-cuttings-ash		....	·49	....	....	....	60·64	11·34	1·85	3·76	1 4 8
Red-apple-ash		....	....	....	....	....	54·52	14·96	0·47	6·00	1 12 4
Ash of kerosene shale		Hartley Vale	1·49	27·93	·70	·85	67·59	....	·28	·14	0 11 1
She-oak-ash		....	....	....	....	....	8·57	42·35	8·85	2·19	1 16 5

* 5 per cent. soluble in water. † Unburnt carbon.

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value.
										£ s. d.
Sea-weed, fresh state	......	80·00	......	·16	......	......	·41	·09	1·18	0 8 6
Sawdust	......	32·52	62·35	·82	1·00	......	......	1·70	·05	0 16 3
Cave-deposit, shells, &c.	Cowan, Hawkesbury River	2·11	......	·82	1·00	......	35·40	1·59	·88	1 0 3
,,	Macleay River	23·06	16·01	2·43	2·95	26·77	13·88	7·40	......	2 14 2
Gypsum	Marulan	(Crystallised $CaSO_4$ = 92·64.)				4·47	......	......	......	......
Flue-deposit	Maitland	......	......	......	......	83·75	2·56	·32	·31	0 2 6
,,	Liverpool	......	......	......	......	91·17	·42	1·29	·17	0 4 6
,, from sanitary furnace	......	......	......	......	......	63·53	6·64	1·82	1·61	0 13 6
Night-soil mixed with lime	......		44·33	·74	·89	18·60	27·62	·78	....	0 12 4
Night-soil	Wagga Wagga		6·70	·03	·04	82·19	·44	·28	·69	0 4 9
,,	,,		9·14	·28	·34	78·92	1·18	·18	·54	0 7 2
,,	,,		......	·50	·61	....	....	·64	·62	0 11 10
Night-soil preparation, No. 1 (a)	,,		8·22	3·73	4·63	50·22	13·32	9·65	·91	4 13 7
,, ,, No. 2 (b)	......		7·20	1·83	2·22	29·02	6·05	4·10	·15	2 4 0
,, ,, No. 3 (c)	......		25·95	1·64	1·99	60·17	1·39	1·61	·70	1 11 6
,, preparation, "Pinhoe" manure.	......	·92	9·54	·21	·25	57·58	14·71	1·26	·56	0 9 4
Night-soil preparation, No. 1	F. Artlett, Parramatta	7·33	30·06	2·10	2·55	46·38	3·74	1·92	·61	1 17 4
,, ,,	,, ,,	10·11	42·59	4·97	6·03	·94	$CaCO_3$ 30·12	·39	......	3 9 1
,, ,,	Mr. "Halstead," O'Brien's patent.	1·54	12·36	·54	·65	77·95	......	·63	......	0 9 2
Farmyard-manure	......	67·96	22·09	·40	·49	8·16	·16	·20	·30	0 7 7
Stable manure	Bathurst	39·26	......	·41	·50	......	......	·27	·67	......
Sheep manure	,,	7·73	......	1·06	1·30	......	......	·69	1·17	......
Sheep dag	......	......	......	3·04	3·69	......	......	......	......	......
Fowl manure	......	3·95	16·48	1·47	1·78	70·16	2·10	1·94	......	1 5 7
,,	......	1·54	15·23	·86	1·04	79·96	·64	·59	·33	0 15 2
Flying-fox manure	......	1·09	35·34	3·34	4·05	50·29	1·02	0·36	1·15	2 12 7
Fish manure	......	10·88	59·26	6·10	7·40	5·39	9·82	8·28	......	5 6 10
Sheep manure	Liverpool Wool-scouring Works.	9·71	50·91	1·79	2·17	32·26	2·0	·91	·92	1 11 10
Bat-guano	......	14·11	17·69	1·55	·88	28·77	13·72	11·42*	......	2 15 8
Bat-guano†	......	10·86	19·65	2·24	2·72	51·95	1·75	3·55	·15	2 3 8
Bat-guano‡	......	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace	5 5 4
Bat-deposit	Cave Flat, Cooradigbee	5·43	12·98	·50	·61	57·64	5·60	12·12	......	2 1 2

* 1 per cent. of the phosphoric acid is water-soluble. † The total nitrogen contains 1·12 nitric nitrogen, ·84 ammoniacal nitrogen, ·28 organic nitrogen. ‡ This analysis was made by Mr. J. C. H. Mingaye, and the total nitrogen contains 1·70 nitric nitrogen, ·64 ammoniacal nitrogen, and 2·42 organic nitrogen.

a 4·86 per cent. phosphoric acid is water-soluble. b 3·03 per cent. phosphoric acid is water-soluble. c ·42 per cent. phosphoric acid is water-soluble.

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value.
										£ s. d.
Guano deposits	Tamworth	8·75	38·40	6·17	7·49	12·85	....	9·24	....	....
„	„	8·42	20·97	3·10	3·76	31·89	....	7·87	....	....
„	„	14·55	29·91	3·66	4·44	15·81	....	12·98	....	....
„	„	9·35	44·32	6·73	8·17	7·33	....	13·17	....	....
Decayed wood (bark and leaves), bloodwood.	....	57·80		·74	·89	40·68	1·30	....	....	0 10 1
Decayed wood (bark and leaves), pepper tree.	....	79·92		·89	1·08	17·77	1·50	....	....	0 12 2
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·60	0 14 1
Coco-nut oil cake	....	8·24	....	3·29	3·99	....	....	1·20	1·49	2 16 1
Castor cake	....	18·81	74·08	4·30	5·22	....	....	1·83	0·86	3 8 5
Pea cake	Java	16·02	....	7·24	8·79	....	....	1·46	1·17	5 9 2
Bean-cake	North China	14·52	80·32	6·77	8·22	....	....	1·33	1·99	5 6 7
Field-pea, whole plant	....	88·53	9·97	·55	·67	....	·15	·12	·49	0 13 5
Tares, whole plant	....	83·97	14·96	·73	·88	....	....	·11	·21	0 11 5
Marsh-mallow, whole plant	....	79·00	17·86	·85	1·03	....	....	·14	·69	0 15 7
Air-slacked lime	....	16·58	....	....	....	1·88	75·44	....	....	....
Residue from calcium carbide	....	41·36	....	....	....	1·08	36·19	....	....	....
Rice husks	....	42·71	42·15	1·07	1·30	13·77	·02	·03	·04	0 14 11
Sea-weed ash	Manly	....	....	....	....	43·06	6·52	·91	13·98	3 14 10
„	„	....	....	....	....	·07	·53	·19	34·30	8 17 9
Muck raked from a water-hole	....	63·66	29·86	·81	·98	3·80	·96	·10	·06	0 11 8
Clinker from locomotive boiler	....	....	....	....	....	....	....	....	0·25	0 1 4
Bone breccia	Queanbeyan	5·71	....	·59	·72	9·48	42·80	3·11	....	0 16 11
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	17·04	3·63 (ash).	....	....	....	....
„ short	„ „	9·72	87·46	14·09	17·00	2·82 (ash).	....	....	....	....

Field Experiments at Bathurst Experiment Farm, 1907.

R. W. PEACOCK.

WHEATS grown at Bathurst Experimental Farm, 1907.

Variety.	Previous crop.	No. of Paddock.	Area.	Date sown.	Seed sown per acre.	Date harvested.	Yield per acre.	Rainfall during growth.	Rainfall for Year.	Remarks.
			area.		lb.		bus lb.	inches	points	
Federation—Plot 1	Maize	12	3·05	18 May	34½	10 Dec	26 43	10·93	Jan., 291	Average yield of paddock, 23 bushels 23 lb. per acre.
Rymer	,,	12	2·91	17 ,,	36½	13 ,,	24 28	10 93	Feb., 116	
Lotts's Wheat	,,	12	1·99	15 ,,	32½	13 ,,	23 45	10·93	Mar., 205	
Gluya's Early	,,	12	0·98	16 ,,	36½	12 ,,	22 35	10·93	April, 135	
Federation—Plot 2	,,	12	4·61	20 ,,	40	9 ,,	21 54	10·93	May, 22	
Dart's Imperial	,,	12	2·02	15 ,,	31½	13 ,,	21 22	10·93	June, 314	
									July, 112	
Tarragon	Bare fallow	15	4 7	24 Apl.	33	18 Dec.	24 13	12·11	Aug., 135	Average yield of paddock, 21 bushels 28 lb per acre.
Power's Fife	,,	15	4·6	25 ,,	29¾	19 ,,	18 39	12·11	Sept., 128	
									Oct., 54	
Cleveland	Rape	6	3·55	9 Apl.	31	14 Dec.	23 51	12·05	Nov., 308	Average yield of paddock, 16 bushels 32 lb. per acre.
Marshall's No. 3	,,	6	1·96	10 ,,	29½	12 ,,	19 43	12·05	Dec., 152	
Sussex	,,	6	1·05	10 ,,	28½	11 ,,	18 52	12·05		
Wanlassa	,,	6	1·04	9 ,,	30½	16 ,,	17 19	12·42	Total,	
Steinwedel	,,	6	1·93	10 ,,	34½	9 ,,	15 48	12 05	19·72	
Power's Fife	,,	6	0 95	9 ,,	30	16 ,,	15 9	12·42	inches.	
Red Glyndon	,,	6	1·14	9 ,,	29¼	16 ,,	15 0	12·42	.....	
White Hogan	,,	6	2·03	10 ,,	28¾	11 ,,	14 36	12·05	.....	
Blue Federation	,,	6	3·33	11 ,,	30¼	9 ,,	14 32	12·05	.....	
Tarragon	,,	6	2·81	10 ,,	31½	11 ,,	12 57	12·05	.....	
Jumbuck	,,	3	2·04	11 ,,	31¼	9 ,,	12 18	12·05	.....	
Rymer	Rape	17	0·86	1 May	33	11 Dec.	26 5	10·97	.....	Average yield of paddock, 17 bushels 47 lb. per acre.
Cleveland	,,	17	3·92	22 Apl.	35	19 ,,	22 42	12·11	.....	
Steinwedel	,,	17	0·75	2 May	37	12 ,,	17 13	10·97	.....	
Bunyip	,,	17	1·79	2 ,,	30¾	10 ,,	14 51	10·97	.....	
Federation	,,	17	0·21	3 ,,	41¼	12 ,,	14 26	10 97	.....	
Cretan	,,	17	1·21	1 ,,	39	12 ,,	14 19	10·97	.....	
John Brown	,,	17	1·82	2 ,,	31¾	12 ,,	14 1	10·97	.....	
Comeback	,,	17	1·93	2 ,,	29½	11 ,,	13 6	10 97	.....	
Steinwedel	Scarlet clover	21	4·00	18 Apl.	29¼	2 Dec.	19 12	11·39	.....	Average yield of paddock, 15 bushels 12 lb. per acre.
Bobs	,, ,,	21	3·21	18 ,,	31	3 ,,	16 17	11·39	.....	
Federation—Plot 1	,, ,,	21	3·14	17 ,,	34½	4 ,,	14 20	11·39	.....	
Federation—Plot 2	,, ,,	21	3·3	17 ,,	34½	4 ,,	11 2	11·39	.....	
Comeback	Black tares	18	4·68	8 May	31¾	6 Dec.	11 29	10 93	.....	Average yield of paddock, 9 bushels 34 lb. per acre.
Jonathan	,, ,,	18	1·84	9 ,,	32¼	7 ,,	9 44	10·93	.....	
Russo-Barletta	,, ,,	18	0·75	9 ,,	34½	13 ,,	9 2	10·93	.....	
Federation	,, ,,	18	2·85	9 ,,	35	13 ,,	6 29	10·93	.....	
Cleveland	Wheat	2	5·6	25 Apl.	30	20 Dec.	16 23	12·11	.....	Yield, 16 bushels 23 lb. per acre.
Bobs	Pumpkins	3	0·85	31 May	61	17 Dec.	15 32	11·20	.....	Average yield, 13 bushels 33 lb. per acre.
,,	Broom millet	3	0·85	31 ,,	61	17 ,,	11 50	11·20	.....	
,,	Sorghum	3	0·85	31 ,,	61	17 ,,	11 37	11·20	.....	
,,	Hungarian millet	3	0·85	31 ,,	61	17 ,,	14 45	11·20	.....	
,,	Maize	3	0·15	31 ,,	61	17 ,,	17 0	11·20	.....	
Bobs	Wheat	5	4·5	6 May	40	20 Dec.	14 42	11·82	.....	Manure experiment.

Total area, 96·96 acres; total yield, 1,667¾ bushels; average yield per acre, 17 bushels 12 lb.; highest yield, 26 bushels 43 lb. per acre.

NOTES.—It will be apparent from the distribution of the rainfall that the spring rains were inadequate for the production of heavy yields. The dry October militated against the early-sown wheats and also against the early-maturing varieties. The good rain of November was too late for the above to recover, but was excellent for the later-sown and later-maturing varieties.

Early wheats, such as Federation, Comeback, and Bobs, were placed at a disadvantage. Mid-season wheats, such as Cleveland and Tarragon, had an advantage. The season also certainly favoured the late wheats, such as Power's Fife (Manitoba variety). It will be seen that Paddock No. 12 gave the highest and most consistent yields. The previous crop was maize, which was harvested just prior to the seeding with wheat. This necessitated a comparatively late seeding. The ground was in excellent tilth, due principally to the frequent summer cultivation of the maize crop. A dressing of 1 cwt. of superphosphate was drilled with the seed. This was applied to give the crop a vigorous start, as well as to augment the supply of available plant-food to make up in some measure for the late seeding and the exhausting effect of the maize. The result was extremely satisfactory, the application giving by far a greater return than any previous application on the farm. The unmanured check-plot was situated in the Federation block. The estimated yields per acre were—

Unmanured	26 bushels 53 lb. per acre.
Manured	39 bushels 6 lb. ,,
Excess over unmanured ...	12 bushels 13 lb. ,,

The effect of the manure was very apparent from the time the crop appeared above ground until harvest.

Paddock No. 15 had been bare-fallowed the previous year and received an application of 1 cwt. of superphosphate per acre with the seed. These wheats were sown earlier than the above. Power's Fife felt the effect of the dry October, and showed such by the slight tip-withering of the ears. Tarragon withstood it much better, as is apparent in the yields. The effect of the bare-fallowing was very marked and attended with good results.

Paddock No. 17.—This paddock whilst under rape the preceding year was stocked heavily during the spring, and practically no crop residue was ploughed under.

Paddock No. 21 is not comparable with the others, it being sown comparatively early in the season with early varieties.

Paddock No. 18 gave the lowest yield, which cannot be attributed to the preceding crop. The unsatisfastory yields were due to the peculiarity of the soil, which readily loses that desirable mechanical condition after winter rains. Early sowing would have been preferable, the greater root development thereby induced would have kept the soil in better condition after the continuous rains of June.

Paddock No. 5 was devoted to a manure experiment and will be treated under that heading. It has grown wheat continuously since the beginning of the experiment.

Paddock No. 2.—A portion of slightly over $5\frac{1}{2}$ acres was placed under wheat to demonstrate the effect of continuously growing wheat as opposed to

rotation. As has been stated the variety Cleveland was favoured by the season, and, when compared with the same variety in the other paddocks, shows a falling off in yield of 6 and 7 bushels per acre.

Paddock No. 3.—This wheat was sown after various crops, and the results will be available in conjunction with other experiments in connection with rotations.

The following is a statement of the wheat yields since 1902:—

1902—Rainfall,	14·83 in.;	average yield,	8⅛	bus.;	highest yield,	23 bus.
1903 ,,	21·68 ,,	,,	26½	,,	,,	42 ,,
1904 ,,	18·26 ,,	,,	24½	,,	,,	38¾ ,,
1905 ,,	18·57 ,,	,,	22½	,,	,,	37½ ,,
1906 ,,	22·89 ,,	,,	26	,,	,,	37¾ ,,
1907 ,,	19·72 ,,	,,	17⅕	,,	,,	26¾ ,,

OATS grown at Bathurst Experimental Farm, 1907.

Variety.	Previous crop.	No. of Paddock.	Area.	Date sown.	Seed sown per acre.	Date harvested.	Yield per acre.	Rainfall during growth.	Rainfall for Year.	Remarks.
			acres		lb.		bus. lb	inches	inches.	
Algerian	Maize	12	3·78	3 May	48¾	25 Nov.	31 25	10·47	19·72	——
Abundance ..	,, ...	12	2·13	13 ,,	49½	13 Dec.	32 15	10·91		——
Red Rust-proof ..	,, ...	12	1·99	13 ,,	58	24 Nov.	20 6	10·45		——
Algerian	Rape	7	0·48	28 Feb.	41	20 Nov.	31 1	13·94	For distribution see Wheats	——
Early Angus ..	Bare fallow ..	7	0·3	27 May	50	18 Dec	22 30	11·65		——
Potato	Canary grass ..	7	0·49	25 ,,	60	18 Dec.	21 17	11·65		——
Carter's Royal Cluster.	,, ,, ..	7	0·49	25 ,,	58	18 Dec.	14 29	11·65		——

Total area, 9·66 acres; total yield, 286 bushels 1 lb., average yield per acre, 29 bushels 24 lb., highest yield, 32 bushels 15 lb. per acre.

NOTES.—The season was an unfavourable one for oats, and favoured the later maturing varieties. The first three are practically comparable, and have proved suitable for the district. Abundance, on account of maturing later, had the advantage of the October rains. Those in Paddock 7 are not comparable, owing to the differences of soil upon which they were grown and the rotations followed.

BARLEYS grown at Bathurst Experimental Farm, 1907.

Variety.	Previous crop.	No. of Paddock.	Area.	Date sown.	Seed sown per acre.	Date harvested.	Yield per acre.	Rainfall during growth.	Rainfall for Year.	Remarks.
			acres		lb.		bus. lb.	inches	inches.	
Cape Barley ..	Scarlet clover	28	4·0	23 Mar.	50	23 Nov.	23 5	11 87	19·72	Cut in winter for green fodder.
Cape Barley ..	Bare fallow ..	7	0·3	27 May	66	27 Nov.	29 36	10·51		——
Cape Barley ..	Maize	3	0 89	30 May	57¼	27 Nov.	18 15	10·51	For distribution see Wheats.	——
Skinless Barley ..	,, ...	3	0·89	31 May	53¼	23 Nov.	12 16	10·30		——
Standwell Barley ..	,, ...	3	0·89	28 May	53⅓	23 Dec.	7 32	11·65		Malting varieties.
Maltster Barley ..	,, ...	3	0·89	29 May	54	23 Dec.	11 48	11·65		
Brewer's Favourite Barley.	,, ...	3	0·89	29 May	48	23 Dec.	12 5	11·65		
Albert Barley ..	,, ...	3	0·89	30 May	64½	23 Dec.	11 42	11·65		

Total area, 9·64 acres; total yield, 167 bushels 37 lb.; average yield per acre, 17 bushels 20 lb.; highest yield, 29 bushels 36 lb. per acre.

NOTES.—Generally speaking the season proved too dry for barleys. The Cape, in Paddock 28, gave a creditable yield after having been cut for green fodder during the winter. The plot in Paddock 7, which had been previously bare-fallowed, gave the highest yield. All the varieties after maize gave an unsatisfactory crop.

RYES grown at Bathurst Experimental Farm, 1907.

Variety.	Previous crop.	No. of Paddock.	Area.	Date. sown.	Seed sown per acre.	Date harvested.	Yield per acre.	Rainfall during growth.	Rainfall for Year.	Remarks.
			acres		lb.		bus. lb.	inches		
Black Winter Rye	Flax	7	0·9	24 May	49	18 Dec	16 58	11·65	*Vide*	——
Emerald Rye ..	Canary grass ..	7	0·43	27 May	41½	18 Dec.	11 30	11·65	Wheats.	——

Total area, 1·34 acres; total yield, 20 bushels 24 lb.; average yield per acre, 15 bushels 6 lb.

APRICOTS DRIED AND SALTED.

COMMONLY CALLED "MEBOS" IN CAPE COLONY.

SOME time ago His Excellency Sir Harry Rawson called the attention of the Department of Agriculture to a table delicacy made in Cape Colony called "Mebos," which he thought worth while experimenting with here, as apricots are grown to perfection in many parts of the State. Lately Miss Rawson has obtained from the Cape a recipe for the process, which she has kindly forwarded to the Department.

The recipe, which is given below, is very simple, entailing no more trouble than ordinary dried apricots.

Take soft ripe apricots, lay them in salt water (about 2 ounces of salt to a quart bottle) for a few hours. Then lay them on a mat to dry in the sun; the next day press them between the hands to flatten and to let the stone come out. The next day repeat the process. At the Cape it generally dries and becomes "Mebos" in three or four days in the sun, but, if the weather should be damp, they might be dried in heated rooms or a cool oven. To crystallise the "Mebos," lay them in lime-water for five minutes till they feel nice and tender, take out, wipe dry on a soft cloth, and rub coarse crystallised white sugar well into each; take 1½ lb. of sugar to 1 lb. of "Mebos." Pack closely with lots of sugar in between, in jars that will cork well.

A very nice sweetmeat, and said to be a remedy for sea-sickness.

Lime-water.—2 tablespoonfuls of fine lime to a quart of boiling water. Mix well, and when the lime has drained to the bottom, pour the clear water into a bottle; cork and keep for use.

Analyses of Soils from Papua.

F. B. GUTHRIE AND R. S. SYMMONDS.

THE following notes on samples of soil submitted by the Director of Agriculture, Papua, and forwarded through the Commonwealth Department of External Affairs, may be of interest to *Gazette* readers who desire information as to the nature of the soils and their agricultural value in this portion of the Commonwealth, and to compare them with typical soils of the mainland, already published in the *Gazette.*

The soils examined are typical of the soils met with in New Guinea, and were collected under the direction of Mr. Staniforth Smith, Director of Agriculture, Papua. Mr. Staniforth Smith reports as follows:—

The twelve samples of soil that have been forwarded to the Director of Agriculture, Sydney, have been obtained from all accessible portions of the Territory. With the exception of the Sogeri soil the elevation has been near the sea level and generally taken from places only a few miles inland from the coast.

In every case a piece of land has been selected which was a fair average of the agricultural land of that district, and in no case has soil been selected that is situated less than 20 chains from a river bank.

A hole, with perpendicular sides, has been sunk to a depth of 18 inches or 2 feet and the soil for analysis taken in slices of even width from the surface to the bottom; any stones found in this have been included. With the two following exceptions none of the soils taken were more than 100 feet above sea-level:—

Sogeri, 1,700 feet. Kemp Welch, about 300 feet.

Speaking generally, these are rich fertile soils of a loamy nature, friable, and fairly easy to work. They are good nitrifying soils, and should be capable, under cultivation, of giving good results with any kind of crop suited to the climate. With the exception of the soils from Woodlark Island and Cheshunt Bay, they may be classed as rather light loams. These two are rather heavy clay loams, but the clay appears to be of a friable nature, and if the drainage is efficient they should present no difficulties to cultivation. The relation of the soils to water are good, the capacity for retaining moisture being in all cases high, and the humus content satisfactory. With one exception, that of the Woodlark Island soil, the capillary power is good, and the soils are in good mechanical condition.

In only one instance, that of the Sogeri soil, is the land sour, and in this case the application of lime appears desirable, as the soil is deficient in this ingredient, and its addition would help materially in sweetening the land. In all other cases the soil is abundantly supplied with lime. They are, on the whole, fairly rich in plant food, nitrogen and phosphates being from satisfactory to good, but are invariably low in potash, and this ingredient would have to be supplied in the case of such crops as tobacco, coco-nut, banana, and fruit-trees generally.

With this exception, it is doubtful whether manuring will be required, at least, for the first few seasons. I am not in a position to speak authoritatively as to their suitability for tropical crops, but they are fertile soils and should give good results with any of the crops cultivated on the mainland. The lighter soils should be capable of producing the finer varieties of tobacco-leaf.

Analyses of Soils from Papua.

Distinguishing mark.	Colour.	Reaction.	Water capacity. (per cent.)	Absolute weight per acre, 6 inches deep.	Capillary power (rise in inches for three hours).	Moisture per cent.	Volatile matter per cent.	Fertilising Substances soluble in hot Hydrochloric Acid, sp. gr. 1·1. Nitrogen per cent.	Lime (CaO) per cent.	Potash (K_2O) per cent.	Phosphoric Acid (P_2O_5) per cent.
No. 1 Woodlark Isld.	Light brown	Neutral	62·0—high	1,255,881	2·2—poor ..	6·36	18·80	·266—good .	1 157—very good	·038—indifferent	·512—very good.
,, 2. Buna Bay ..	Grey ..	Neutral	46·0—good	1,765,023	10·0—excellent .	1·10	5·02	·126—satisfactory	·722—good ..	·069—fair ..	·205—good.
,, 3. Milne Bay ..	Dark brown	Faintly acid	45·0—good	1,798,965	10·0—excellent .	2·55	5·90	·182—good .	1·593—very good	·252—good ..	·999—excellent.
,, 4. Cloudy Bay ..	Light brown	Faintly acid .	55·5—high	1,595,309	10 0—excellent	6·15	8·65	·098—fair .	·765—good	·081—fair ..	·227—good.
,, 5. Sandbank Bay	Brown ..	Faintly acid ..	56·5—high	1,493,481	8·0—very good	7·47	12·30	·238—good	1·267—very good	·095—fair ..	·094—fair.
,, 6. Cheshunt Bay	Dark brown	Faintly acid ..	60·0—high	1,459,538	6 5—good .	10·57	17·50	·392—good .	2 113—very good	·074—fair ..	·117—satisfactory.
,, 7. Marshall's Lagoon.	Brownish ..	Very faintly acid	48·5—good .	1,798,965	4·0—fair ..	8 46	9·23	·182—good ..	1·591—very good	·153—satisfactory	·205—good.
,, 8. Kemp Welch River.	Grey .	Neutral	49·0—good	1,737,868	10 0—excellent	1·87	4·40	·098—fair .	.633—good ..	·043—indifferent	·193—satisfactory.
,, 9. Rigo	Brownish ..	Neutral .. .	50·0—good	1,561,366	7·0—good ..	6·76	8·90	·140—satisfactory	4·335—very good	192—satisfactory	·125—satisfactory.
,, 10. Sogeri	Brown ..	Very strongly acid	57·0—high	1,357,711	10·0—excellent	10·43	13·67	·182—good ..	·048—bad .	·023—bad ..	·231—good.
,, 11. Laloki	Light brown	Faintly acid ..	64·0—high	1,493,481	4 5—fair ..	6·13	7·52	·126—satisfactory	·437—satisfactory	·054—fair.. ..	·210—good.
,, 12. Oikapu ..	Dark brown	Faintly acid .	45 0—good	1,765,023	4·0—fair .	6·18	8·49	·182—good ..	·563—good .	·312—good ..	·192—satisfactory.

Mechanical Analysis.

Percentages calculated on moisture—free soil.

Distinguishing mark.	Nature of Soil.	Stones—particles over 5 mm. diameter.	Gravel—particles 2 to 5 mm. diameter.	Coarse Sand—particles 1 to 2 mm. diameter.	Sand—particles ·03 to 1 mm. diameter.	Fine Sand—particles ·02 to ·03 mm. diameter.	Silt—particles ·01 to ·02 mm. diameter.	Fine Silt—particles ·005 to 01 mm. diameter.	Clay—particles below ·005 mm. diameter.
No. 1. Woodlark Island	Clay loam	4·54	2·00	1·06	20·24	4·12	3·16	1·88	56 64
,, 2. Buna Bay	Loamy sand	None	None	None	82 70	2·34	1·70	1·70	10·46
,, 3. Milne Bay..	Sandy loam	1·54	3·14	3·87	68·50	3·20	2·20	1·60	13·40
,, 4. Cloudy Bay .. .	Loam	None	None	None	55·70	6·33	4·00	3·00	24·82
,, 5. Sandbank Bay	Loam	0·33	2·80	3·80	48·64	5·08	3 81	3·81	24·26
,, 6. Cheshunt Bay	Clay loam	None	None	None	29·30	6·70	5·00	5·00	43·43
,, 7. Marshall's Lagoon ..	Loam	None	None	None	51·00	11·33	4·33	5·00	19·88
,, 8. Kemp Welch River ..	Loamy sand	None	None	None	80·00	4·33	2·00	2·00	9·80
,, 9. Rigo	Loam	None	None	None	58·30	7·70	5·33	4·70	17 21
,, 10. Sogeri	Loam	4·54	1·14	1·06	41·40	3·80	2·22	6·04	29·37
,, 11. Laloki	Loam	None	None	None	40·70	16·00	7·00	6·33	23·84
,, 12. Oikapu	Loam	1·54	1·66	2·94	53·40	8·60	4·78	4·78	20·90

The Score Card.

P. QUIRK.

THE system of judging stock by points is nothing new. So far back as 1891 the late Mr. A. Bruce, Chief Inspector of Stock, issued a valuable pamphlet on "Points of Stock and their Relative Value." This system has not received the attention it deserves, as the practice of deciding on the merits or demerits of an animal by a cursory examination, which results very often in the prize being awarded to the wrong exhibit and not on the essential value of the animal.

Agricultural societies look upon the point system as an experiment, and prefer to go slowly by trying the experiment on the youths of the district by means of the score card in judging dairy cattle. A prize is held out for the youth who judges best on points. It has repeatedly come under my notice where the wrong competitor has gained the prize, as awards are made on totals and not on the sum of the difference of points from the judge. Appended are two Score Cards, No. 1 and No. 2.

Now take No. 1 Score Card. The maximum number of points, or perfection, in a dairy cow is, say, 200. The judge has credited the animal with 179 points. The competitor credits her with 174 points; therefore, on totals, he only loses 5 points, whereas actually he has differed from the judge to the extent of 23 points. Take again No. 2 Score Card in the same competition, the same judge, and animal. The competitor's total is 167 points, and he differs from the judge 12 points as against 5 points in No. 1 Score Card, whereas No. 2 only differs from the judge 14 points as against No. 1 23 points. So that it is obvious the compiler of No. 2 Score Card has done the best judging and should be awarded the prize. To explain further: Say a youth is 2 points above the judge in one place and 2 points below him in another; he has balanced his account and his total is equal to the judge, although he has missed 4 points.

The Score Card is a splendid system for the training of youths. We have used it for years on the Government Stud Farm in the training of students, and have found it invaluable, as every point in a dairy cow has, as compared with another, a certain definite value. It would be a progressive movement, and the system would be of high educational value to the youth competing, and also the general public, if the judges compared the Score Cards and explained where each competitor had failed, and also gave reasons for his decisions as to the desirable and undesirable points of a dairy cow.

No. 1 Score Card.

	Maximum Points.	Judges' Points.	Competitor's Points.	Points Lost.
Style and general appearance ...	20	18	17	1
Colour ...	4	4	3	1
Head ...	10	8	9	1
Neck ...	5	4	4	...
Forequarters ...	12	11	10	1
Back ...	10	9	7	2
Body ...	15	14	12	2
Flanks ...	4	3	4	1
Hindquarters ...	12	10	11	1
Thighs ...	8	6	7	1
Legs ...	6	6	5	1
Udder ...	30	28	26	2
Milk veins ...	10	10	8	2
Teats ...	10	9	10	1
Escutcheon ...	12	10	11	1
Tail ...	4	4	3	1
Temper ...	8	8	7	1
Size ...	10	9	10	1
Skin ...	10	8	10	2
	200	179	174	23

No. 2 Score Card.

	Maximum Points.	Judges' Points.	Competitor's Points.	Points Lost.
Style and general appearance.	20	18	18	...
Colour ...	4	4	3	1
Head ...	10	8	7	1
Neck ...	5	4	4	...
Forequarters ...	12	11	9	2
Back ...	10	9	8	1
Body ...	15	14	13	1
Flanks ...	4	3	3	...
Hindquarters ...	12	10	10	...
Thighs ...	8	6	6	...
Legs ...	6	6	5	1
Udder ...	30	28	27	1
Milk veins ...	10	10	8	2
Teats ...	10	9	8	1
Escutcheon ...	12	10	9	1
Tail ...	4	4	4	..
Temper ...	8	8	8	...
Size ...	10	9	8	1
Skin ...	10	8	9	1
	200	179	167	14

Notes on Lucerne at Wagga Experiment Farm.

G. M. McKEOWN.

THE site occupied by the crop is one of the highest parts of the farm, situated between two hills of granite formation, from which it is considered that moisture reaches the intervening depression by soakage at a depth at which it is available for the benefit of the crop. The land was ploughed to a depth of 6 inches with rotary disc ploughs in the second week in August, and the seed was sown about the middle of the month.

Hunter River seed was sown at the rate of 3 lb. per acre by means of a grass-box attached to an ordinary wheat-drill, together with 56 lb. of superphosphate per acre.

The land was rolled after sowing, and the seed germinated early. Three months after sowing, the crop was cut and harvested for a yield of 4 cwt. of hay per acre, which was then worth 7s. per cwt. A month later it was stocked with sheep consisting chiefly of rams and large-framed cross-bred wethers at the rate of seven per acre. Portion of the crop was cut and allowed to lie as the mower left it, for the stock to pick up. These sheep were allowed to remain on the crop for eighteen days, and after the lapse of twenty-five days they were again put in, remaining for eleven days.

Fourteen days later it was again fit for moderate stocking, although the growth was too short for cutting.

It is intended to cut for hay all growths of sufficient length, and when the growth is too short for this purpose it will be cut for feeding on the ground.

The rainfall from 1st January to the end of October was 907 points, and the subsequent records were—November 209, December 286, January nil, February 219.

LINSEED (*Linum usitatissimum*).

IN view of the fact that bounties are being offered by the Federal Government for the production of linseed, or the fibre which is obtainable from the plant under favorable conditions, attention is drawn to the desirability of farmers testing this crop in Riverina.

At Wagga fair crops of linseed have been obtained; but the growth of the plant for fibre has not been satisfactory, as it has been short and branching, defects which depreciate its value.

It is probable that in the higher portions of the district fibre of the best quality can be grown, while the seed yield should also be increased. The land intended for the crop should be ploughed as deeply as the soil will admit, without bringing sour subsoil to the surface. It should be well pulverised and levelled by harrowing.

Seed at the rate of 40 lb. per acre should be sown broadcast, and lightly covered by harrowing, followed by the use of the roller.

The seed may be sown from March to the middle of May, April being the best month.

METEOROLOGICAL BUREAU, No. 4 DIVISION, NEW SOUTH WALES.

Weather Conditions during February, 1908.

S. WILSON,
Divisional Officer.

THE month opened with a cyclonic storm centrally situated on the seaboard between Jervis Bay and Port Macquarie, where it caused severe gales and very rough sea. This disturbance was attended by good rains over our State generally, which persisted until Tuesday, the 4th instant. In Queensland, also, light to heavy rainfall was recorded during this period. The largest totals in New South Wales were in and around the Metropolitan area, as follow:—1,154 points at Lawson, 1,147 at Katoomba, 1,072 at Kurrajong, 1,000 at Wollongong, 866 at Springwood, 736 at Camden, 715 at Parramatta, 653 at Picton, 613 at Blackheath, 605 at Ulladulla, 532 at Sydney, and 501 at Bowral.

The distribution during this rainstorm, which persisted from 29th January to 4th February, was:—

On North Coast	from	55	points at	Kempsey	to	200	at	Nambucca.
Hunter and Manning	,,	131	,,	Cape Hawke	,,	408	,,	Jerry's Plains.
Metropolitan	,,	426	,,	Windsor	,,	1,072	,,	Kurrajong.
South Coast	,,	88	,,	Gabo	,,	1,000	,,	Wollongong.
Northern Tablelands	,,	24	,,	Uralla	,,	397	,,	Tenterfield.
Central Tablelands	,,	250	,,	Blayney	,,	1,154	,,	Lawson.
Southern Tablelands	,,	55	,,	Kiandra	,,	421	,,	Araluen.
North-western Slope	,,	70	,,	Manilla	,,	384	,,	Blackville.
Central-western Slope	,,	167	,,	Parkes	,,	445	,,	Gilgandra.
South-western Slope	,,	3	,,	Junee	,,	287	,,	Marsdens.
North-western Plain	,,	47	,,	Mogil	,,	224	,,	Walgett.
Central-western Plain	,,	7	,,	Quambone	,,	305	,,	Trangie.
Riverina	,,	41	,,	Balranald	,,	364	,,	Cudgellico.
Western Division	,,	8	,,	Wanaaring	,,	365	,,	Euabalong.

Monsoonal conditions reappeared on the 5th, resulting in unsettled weather over the north-west half of the continent, attended by light rain over the southern seaboard, and moderate to heavy in Central Australia; but in New South Wales only two stations reported rain, viz., Manning Heads and Sydney, with 5 points and 2 points respectively. Otherwise, in our State it was fine generally. On the 6th and 7th the rain area on the coast expanded, and light to moderate falls were recorded south from Port Stephens, and moderate at Cape Byron on the North Coast.

Mild temperatures ruled generally during the first week of the month, 100 degrees in the shade being exceeded at only a few scattered stations in

the Western Division, North-west Plains, Riverina, and North-west Slope. The highest were reported from the western districts, where Menindie headed the list with 110 degrees, followed by Euston with 106 degrees; Deniliquin, in Riverina, with 105 degrees; and Hay, 104 degrees. On the 6th, Bourke had 105 degrees, and Mount Hope and Brewarrina 104 degrees each.

At 9 a.m. on the 8th, an energetic high pressure was situated over the south-west half of the continent, with a central barometric value of 30·3 in the south-west corner; whilst the rear isobars of another were shown over eastern Queensland. Between these two anticyclones, and covering New South Wales, Victoria, and Tasmania, was a steep "Antarctic Low," with its least pressure reading 29·17 inches at Hobart.

Rainfall associated with thunder resulted over Central and Eastern Australia, in parts heavy. Charlotte Waters reported 193 points, and Alice Springs 185 points; at Thursday Island 270 points were recorded, and in South Australia McDonnell had 100 points. In New South Wales the falls were fairly general, the heaviest being registered over the north-east quadrant. Dungog had 280 points; Quambone, 207; Lismore, 187; Enngonia, 180; Taree, 185; Brewarrina, 176; Scone, 165; Warialda, 162; Moree, 160; and Singleton, 153 points.

By Monday, the 10th, the disturbance had passed seaward and the high pressure covered the greater part of the continent, with its centre over the Great Australian Bight. A depression, however, still existed over the northern border, eastern Queensland, and our north-east districts, and was responsible for further light to heavy falls over that region. Port Darwin had 172 points and Rockhampton 170 points. In our State the heaviest falls occurred at Lismore, with 404 points: Cape Byron, 370; Millie, 184; Clarence, 172; and Casino, 153 points.

During the 11th and 12th the depression had become the dominant weather feature over the Eastern States, and caused fresh to strong east to south-east winds, with rough to high seas on the North Coast. The rainy conditions intensified over the north-east half of New South Wales, and consistently heavy falls were recorded on the North-west Plains, Slopes, Tablelands, and North Coast, as also over the Hunter and Manning Districts. Amongst the largest amounts were—Casino, 442 points; Tweed Heads, 405; Mogil, 397; Nambucca, 395; Millie, 314; Byron Bay, 313; Kunopia, 301; Tabulam, 291; Wee Waa, 278; and Dungog, 265 points.

At 9 a.m. on the following day the pressure distribution presented somewhat similar features to those of the 8th, and some good falls were reported from scattered places over Queensland and Northern Territory. Rockhampton had 320 points; Brisbane, 156; Thursday Island, 115; and Port Darwin, 143 points. In New South Wales, on the 14th, an isolated heavy fall was registered at Tambar Springs—164 points; but, otherwise, the rainfall was light to moderate and confined to the north-east quadrant.

The distribution of rainfall over New South Wales during the week ended the 14th, was as follows:—

Western Division	from	2	points at	Menindie	to	225	at Brewarrina.
North-western Plain	,,	236	,,	Boggabilla	,,	615	,, Manilla.
Central-western Plain	,,	10	,,	Ungarie	,,	329	,, Quambone.
Riverina	,,	9	,,	Hillston	,,	40	,, Jerilderie.
North-western Slope	,,	115	,,	Bundella	,,	455	,, Barraba.
Central-western Slope	,,	16	,,	Forbes	,,	224	,, Tambar Springs.
South-western Slope	,,	15	,,	Wyalong	,,	91	,, Tumbarumba.
Northern Tableland	,,	110	,,	Emmaville	,,	455	,, Tabulam.
Central Tableland	,,	6	,,	Orange	,,	210	,, Cassilis.
Southern Tableland	,,	2	,,	Queanbeyan	,,	66	,, Kiandra.
North Coast	,,	258	,,	Grafton	,,	847	,, Lismore.
Hunter and Manning	,,	98	,,	Seal Rocks	,,	398	,, Manning.
Metropolitan	,,	75	,,	Parramatta	,,	209	,, Kurrajong.
South Coast	,,	8	,,	Sutton Forest	,,	144	,, Wollongong.

On the 15th the weather chart showed an anticyclone of some energy, occupying about one-half of the area of the continent, with its highest barometric value—30·2 inches—over the Great Bight. Another "high" was just leaving the eastern seaboard of Queensland. The rear isobars of a low pressure were also shown over our Eastern districts and Tasmania. With this distribution some isolated rainfall, associated with thunderstorms, was reported from Queensland and Northern Territory. Mein had 186 points; Port Darwin, 41; and Daly Waters, 9. Light to moderate falls were also recorded on the Victorian Coast, and in the south-east corner of New South Wales. Fresh to strong south-west to southerly winds occurred over the South-eastern States, with moderate to rough seas along the Victorian and our South Coast.

Within the next forty-eight hours a great change had taken place in the pressure distribution, for the "low" had passed off our coast to the Tasman Sea, being superseded by a portion of the anticyclone, now very deflated and unsymmetrical owing to the influence of an extensive monsoonal depression which had developed over the greater part of the continent, with its centre in the north-west half. Thunderstorms accompanied by light to heavy rainfall occurred in Northern Australia. Katherine reported 196 points; Port Darwin, 83; Daly Waters, 80; and Burketown, 45 points. In Queensland and New South Wales the falls were light and unimportant and confined chiefly to the seaboard. On the 18th, the rear portion of the anticyclone was situated over Tasmania and the eastern district of Queensland, New South Wales, and Victoria, whilst the "monsoonal tongue" had extended about 300 miles southward; and another, but incipient, low pressure appeared over the southern coastline, stretching from Eucla to Portland. In the south-west corner of West Australia the northern portion of another high pressure was shown.

This distribution was responsible for light to heavy rainfall over various parts of the continent. The chief falls in West Australia were—130 points at Hamelin Pool, 104 at Cue, and 101 at Carnarvon. In Queensland 123

points at Lochnagar was the chief amount, followed by 108 at Mitchell. The falls in the Northern Territory and South Australia were only light to moderate. In New South Wales light to heavy falls were registered over parts of the north-east quarter, the heaviest being 175 and 136 points, respectively, at Wee Waa and Pilliga, on the North-west Plain; 103 at Quambone, on Central Western Plains; 115 at Uralla, on Northern Tableland; and 120 at Jerry's Plains, and 100 points at Seal Rocks, in Hunter and Manning Districts.

On the 19th, the high pressure was situated over the north-east quadrant of our State and south-east portion of Queensland, with its centre between Rockhampton and Brisbane, whilst another "high" covered the southern districts of the continent from Portland, in South-west Victoria, to Perth, in West Australia. Between and north of these two high-pressure systems were three depressions. The "monsoonal tongue" was still over Central Queensland, its west portion extending to the west coast of Australia; the second one was situated over Tasmania; and the third, which was a cloud-curve depression, covered the south-western half of our State.

As the result of the above, rainfall associated with thunderstorms was experienced over many parts of the continent. Fully two-thirds of New South Wales benefited from falls varying from light to heavy, east of a line joining Wanaaring, Mossgiel, and Corowa, with the exception of that part of the seaboard between Taree and Nambucca Heads. The heaviest amounts were—214 points at Warren, 205 at Picton, 196 at Coonabarabran, 189 at Scone, 178 at Quirindi, 175 at Jerry's Plains, 165 at Murrurundi, 150 at Mungindi, 144 at Canonbar, 128 at Walgett, 123 at Nowra; and in the Metropolitan area Beecroft had 134; Gordon, 131; Turramurra, 104; Bankstown, 88; and Sydney, 42 points. At Kangaroo Valley, in South Coast district, an exceptionally heavy and destructive hailstorm occurred. Isolated heavy falls were reported from Queensland and West Australia. Thursday Island had 362 points, and Carnarvon 135 points.

At 9 a.m. on the 20th, the high pressure over South Australia was shown to have travelled at an abnormally rapid rate eastward, to the extent of about 1,100 miles; its centre being then to the south of Adelaide. It now covered all the southern part of the continent from Geraldton to Sydney, having displaced the two low pressures over the South-eastern States; but the monsoonal depression still hovered in Queensland and our northern border districts. During the ensuing twenty-four hours the high pressure had become the chief weather control of Australia, with indications of monsoonal influence still over Queensland and portions of our inland districts.

The centre, to the value of 30·5 inches, was now to the south of Tasmania, having travelled about another 900 miles eastward. At 9 a.m. on this date, consistent rainfall was reported from the north-eastern quadrant of New South Wales, and here and there on the northern border, as also from scattered places on the South Coast, South-west Slope,

and Riverina. Some heavy falls were recorded in the north-east quarter, the principal amounts being—Nambucca, 379 points; Tabulam, 369; Kyogle, 330; Manning Heads, 328; Woolgoolga, 321; Grafton, 290; Lismore, 265; Seal Rocks, 210; Warialda, 203; Cape Hawke, 202; Nundle, 184; Tamworth and Narrabri each 183; Armidale, 180; Gunnedah, 174; and Port Macquarie, 150; the remaining amounts varied from a few points to about 100 points.

On the 22nd, some additional heavy falls were reported from the central part of the seaboard. Port Macquarie had 308 points; Manning Heads, 190; Camden Haven, 156; Cape Hawke, 140; Seal Rocks, 130; and Newcastle 105 points. The weather chart showed that the high pressure had surged slightly southward, and lost somewhat in its central barometric value over Tasmania where the greatest reading was now 30·4 inch. With this movement southward, the monsoonal conditions extended also and intensified, although, speaking generally, the anticyclone covered practically the same area as the preceding day. The winds on the coast of New South Wales were still fresh to strong from the south and south-east; but inland they were blowing more consistently from the east and had freshened. By the 24th, the anticyclone had contracted considerably eastward, and the axis of the main body of it had wheeled round from an east and west direction to north-east and south-west. It now covered only the South-east States, having lost one-tenth in the central reading, which, at 9 a.m., was 30·3 in. Monsoonal indications were also shown between the Queensland coast and Norfolk Island. Between Saturday, the 22nd, and the following Monday, an exceptionally heavy rainstorm occurred over the Hunter and Manning districts, and resulted in phenomenally heavy falls there. The largest amounts were—1,045 points at Newcastle, 908 at Maitland, 805 at Camden Haven, 729 at Paterson, 659 at Gresford, 594 at Singleton, 545 at Dungog, and 531 at Port Macquarie. In the Metropolitan area, 527 points at Kurrajong Heights, 472 at Turramurra, and 471 points at Mount Colah. These falls are included in the following statement of the distribution of rain from the 18th to the 25th inclusive, over the various subdivisions of the State:—

North Coast	from	169	points at	Mullumbimby	to	705	points at	Woolgoolga.
Hunter and Manning	,,	264	,,	Murrurundi	,,	1,577	,,	Newcastle.
Metropolitan	,,	130	,,	Sydney	,,	776	,,	Kurrajong.
South Coast	,,	9	,,	Gabo	,,	286	,,	Picton.
Southern Tablelands	,,	44	,,	Bungendore	,,	258	,,	Braidwood.
Central Tablelands	,,	7	,,	Blayney	,,	646	,,	Lawson.
Northern Tablelands	,,	107	,,	Walcha	,,	609	,,	Tabulam.
North-western Slope	,,	40	,,	Bendemeer	,,	296	,,	Warialda.
Central-western Slope	,,	28	,,	Gilgandra	,,	313	,,	Coonabarabran
South-western Slope	,,	20	,,	Morangarell and Junee.	,,	143	,,	Tumbarumba.
Central-western Plain	,,	13	,,	Nyngan	,,	226	,,	Warren.
North-western Plain	,,	15	,,	Moree	,,	276	,,	Wee Waa.
Riverina	,,	5	,,	Moulamein	,,	160	,,	Cudgellico.
Western Division	,,	2	,,	Bourke	,,	227	,,	Euabalong.

For the most part mild temperatures ruled over the State during the month, but occasionally, as when the frontal portion of a "low" reached the Western districts, 100 degrees in the shade was exceeded. The highest points attained were 115 degrees and 113 degrees respectively at Bourke and Brewarrina on the 8th.

The percentage distribution of rainfall over the various subdivisions of the State during February, 1908, was as follows:—

		Percentages. Above normal.		Percentages. Below normal.
North Coast	from	5 to 66		—
Hunter and Manning	,,	107 to 496		—
Metropolitan	,,	40 to 197		—
South Coast	,,	367	to	57
Northern Tableland	,,	36 to 190		—
Central Tableland	,,	21 to 177		—
Southern Tableland	,,	142	to	39
North-western Slopes	,,	71 to 225		—
Central-western Slopes	,,	78 to 236		—
South-western Slopes	,,	192	to	25
North-western Plains	,,	64 to 256		—
Central-western Plains	,,	361	to	48
Riverina	,,	422	to	17
Western Division	,,	482	to	69

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia, as far as data are available for the month of February, 1908:—

	Departure from normal. Pressure.	Departure from normal. Temperature.	General Conditions (referring to State as a whole).
	Inches.	Degrees.	
India	–·04	+0·7	Normal.
Sydney (N.S.W.) ...	–·02	+0·3	Excepting a few scattered places in Western Division and Southern Districts, rainfall much above average.
Melbourne (Victoria)	–·06	–2·0	Dry.
Perth (W.A.) ..	–·04	–0·8	Considerably above in Shark's Bay District, below on north-west coast, normal elsewhere.
Adelaide (S.A.) ..	–·03	+0·8	Rather patchy, mostly normal.

Barometric pressure, as shown by the above table, was below average in India and Australia, whilst temperature in India, at Sydney and Adelaide, was above, and at Melbourne and Perth, below normal.

Seasonable Notes.

Notes on some of the lesser known varieties of Wheats available for Farmers' Experiments.

GEO. L. SUTTON,
Wheat Experimentalist.

Some of the wheats referred to last month as being available for farmers' experiments are now well known to farmers, but as others are not so well known, and some of them are being placed in general cultivation for the first time, a few details regarding their characteristics are sure to be of interest to those engaged in the industry.

Bunyip.

This is a very early variety, being about a week earlier than Federation, and about a fortnight earlier than Steinwedel. On account of its extreme earliness, to plant it early in the season is to court failure with it; towards the end of May will be found quite soon enough to sow it. This variety seems admirably suited for our warm dry districts, and will be found very valuable for late planting. It is not a rust-resister, but because of its especial earliness it is likely to escape injury from this pest.

The growth is vigorous, fairly compact, and erect, and, like Federation, the plant is short and strong. These qualities, combined with the fact that it does not readily shell, make it admirably suited for those districts where stripping is general.

Its short stiff straw and rather pale colour, however, cause it to be rather unsuitable for hay. After heading, because of its upright and level-headed character, a crop of this wheat presents a most attractive appearance in the field. The grain is large and plump, and when milled produces about 70 per cent. of flour, with a strength of 52·6, and having 11·5 per cent. of dry gluten.

Comeback.

This wheat is not as well known in this State as in South Australia, where it has proved to be a satisfactory yielder, and to produce flour equal in strength to that of the Fife or Manitoba varieties.

Because of its earliness it is likely to prove very suitable for our warm, dry districts; and because of the character of its foliage, which indicates that t will resist rust, it is worth a trial on our coastal areas.

It is a vigorous growing early variety, with clean, slender, but e'astic, straw, qualities which make it valuable as a hay wheat.

Bunyip.

Comeback.

The straw is fine enough to appear weak, but it evidently makes up in elasticity what it lacks in stoutness. Last season, at the Cowra Farm, a crop 5 feet high was beaten down by heavy rain just as it was ripening early in

November. It was then feared that it would be impossible to harvest the laid crop with the stripper, and that it would be very difficult to cut it with the reaper and binder, but such was the elasticity of the straw that a few weeks later the crop of about 10 acres was stripped, and averaged between 32 and 33 bushels per acre. So far, we have had no trouble with it shelling, but if it held its grain a little tighter it would be an improvement. It strips about as easily as Early Purple Straw.

Should it, on further trial, maintain its ability to yield as it has done in the past, it is sure to become a great favourite with farmers, as it possesses the desirable properties of quick maturity and suitability for either hay or grain.

As a milling wheat it is amongst the very best. This season buyers have been offering 3d. to 6d. per bushel premium for parcels of this wheat. A milling test, made by Mr. Guthrie, the Departmental Chemist, of the best sample grown this year at Cowra, shows that the grain weighed 65¼ lb. per bushel, and produced 70·5 per cent. of flour of excellent colour, which had a strength of 61·5, and contained 15·74 per cent. of dry gluten. These are the best results we have had, and they at once stamp Comeback as being in the very front rank of milling wheats.

An extensive baking trial, conducted by one of the largest Sydney bakers, with flour made from this variety, proved in actual practice that the quality of the flour was quite equal to the best imported American (Manitoba).

Such results are very gratifying, and combined with the fact that this variety yielded up to 36 bushels per acre last year at Cowra, show that the climate of New South Wales is admirably suited to the profitable production of the very highest class of wheats.

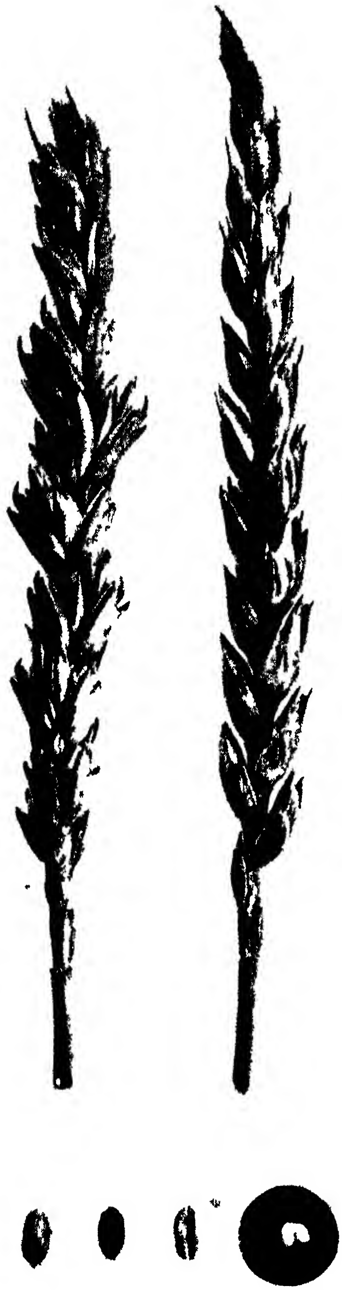
Firbank.

This variety is the result of a cross between the well-known Zealand and a crossbred called Maffra. It is very early, and is specially suitable for hay, the straw being sweet, soft, and of excellent colour. Should it prove, under farmers' trials, as prolific and otherwise as suitable for hay as Zealand (or Berthoud), it is likely to replace that variety, for Firbank is about fourteen days earlier than it. If required for hay, it should not be sown before mid-season; but if sown early, it will be ready to cut for ensilage before the "black oat" ripens, and if utilised in this way it will prove a very valuable aid in profitably ridding dirty paddocks of that pest.

Last season the yield of hay from a small plot of this variety planted on May 8 was at the rate of 2 tons 16 cwt. per acre.

Florence and Genoa.

These wheats are the successful results of the efforts, initiated by the late William Farrer in 1901, to produce varieties so resistant to smut (bunt) that it will be unnecessary to treat the seed with bluestone or other preventives of smut before sowing it.



Firbank

Genoa.

To ensure that these wheats will be resistant to smut, each generation of the cross was subjected to the following rigorous treatment, which is as severe as it is possible to devise. The seed before being planted was so thoroughly infected with smut spores as to be quite black with them. The extent of infection may be judged by comparing the illustrations Figs. 1 and 2 with each other. Fig. 1 is from a photograph of the grain before it was infected, and Fig. 2 of the same grain after infection. The seed after being thus infected—and in a degree never to be met with under ordinary conditions—was planted without further treatment. From these tests Florence and Genoa have emerged triumphant in regard to their ability to resist smut; they have proved themselves to be over 99 per cent. smut resistant, that is to say, that out of 100 seeds thoroughly infected in the manner described 99 plants have been found to be entirely free from smut at harvest time.

To ensure that the freedom from smut is due to the inherent ability of the plants to resist the attacks of the parasite, steps are taken to determine that the absence of smut is not because of seasonal or other peculiarities.

Florence and Genoa are the result of the same crosses; the varieties used in their production being White Naples, Improved Fife, Hornblende, and an Indian wheat.

Florence is a very early wheat, Genoa being about a fortnight later, otherwise they have similar characteristics. Both are vigorous growers, stooling feely, with rather narrow stiff leaves; they are of medium height, with straw of good colour right to the ground. Genoa holds its grain rather more firmly than Florence, which gives promise of being more suited to the warm dry districts than Genoa; it also promises to be more prolific. Last season at Cowra, its yield in a small field trial was at the rate of 35 bushels per acre, exceeding that of Genoa by 41 per cent.

As milling wheats they rank very high; a test made by Mr. Guthrie shows that the grain weighs 68¾ lb. per bushel, produces 74½ per cent. of flour, with a strength of 52, and containing 13·9 per cent. of dry gluten.

The introduction of these wheats marks another stage in the history and progress of wheat-breeding in New South Wales. With their advent, the production of smut-resisting varieties has passed the experimental stage, and is now well within the realms of practical agriculture. Their introduction indicates to the farmer that, in the very near future, the operation of treating seed grain for the prevention of smut will be unnecessary. For even if these varieties do not prove for farmers' requirements equal to those already in cultivation, other smut-resistant varieties will soon be available to suit any of our conditions.

Jumbuck.

This variety is rather late, being about the same season as Genoa, and is suitable for early planting in warm dry districts, or for mid-season planting on the cool tablelands. It is of the same breeding as Tarragon, which is the

result of a cross with Improved Fife and Tardent's Blue with Lambrigg, Australian Talavera. It is an erect rather compact grower of medium height; the leaves are fairly stiff but narrow; the ears are rather square, and have woolly chaff, hence the name Jumbuck.

It is likely to prove a good hay wheat and prolific yielder. In 1906, at Cowra, it was consistently the best yielder, and

[Florence.

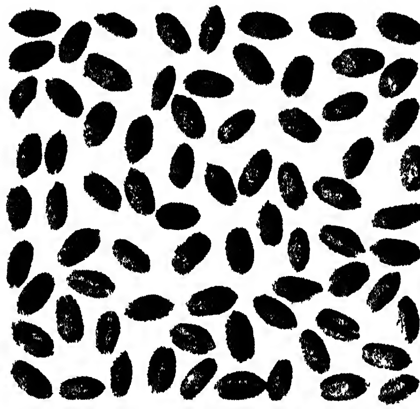


Fig. I.—Clean seed.

Fig. II. Seed (same as Fig. I) infected with smut spores to test the ability of the variety to resist smut.

last season, when planted in April, it produced at the rate of 31¼ bushels per acre, and when planted six weeks later, at the rate of 27 bushels. The computed yields of hay per acre were 2 tons 12 cwt. and 2 tons 4 cwt. for

Jumbuck.

Thew.

the respective plantings. As a milling wheat, it is similar in composition to Tarragon, which weighs about 62½ lb. per bushel, produces 78 per cent. of flour, having a strength of 53, and containing 13 per cent. of dry gluten.

Thew.

This is another early vigorous variety, of medium stooling and rather spreading habits; the foliage is dark green, and the straw soft and of good colour right to the ground, qualities which make it admirably suited for hay. The head is rather open, but the grain is held firmly. Last season it was one of the most prolific hay wheats at the Cowra Experimental Farm, yielding up to 3 tons 2 cwt. per acre. It has also proved suitable for hay in the trial plots, at the Hawkesbury Agricultural College. It is well worth a trial in the coastal districts, and is likely to prove suitable for other districts where early wheats are desired.

A sample of the grain milled as follows:—

Flour...	...	6·4 per cent.
Strength	...	56·4 quarts per sack.
Dry gluten	...	15·4.

A result which shows it to be an excellent milling variety.

Concentrated Grape Juice for Sweetening Wine.

M. BLUNNO.

As no sweetening ingredient other than fresh or concentrated grape juice is permitted in the manufacture of wine, it will no doubt be of assistance to many if I briefly describe the process, which is very simple.

The apparatus required consists of a boiler, with steam jacket, or a boiler in which a steam coil can be fixed. If, however, neither of these are available, an ordinary copper boiler may be used for concentrating the juice.

The juice is first strained through a piece of gauze, and then put in the boiler and brought to the boiling point, and maintained at this temperature until the bulk is reduced from one-half to two-fifths of its original volume. While boiling it must be stirred from time to time to prevent the bottom layer of juice from burning, in which case the juice would contract a peculiar burnt taste, that to many is not agreeable. The juice so concentrated keeps for any length of time, provided it is kept in very clean vessels or glass, and is well corked.

It is preferable to use a copper boiler, tinned inside.

A slow steady boiling is better than piling on firewood to hasten the process.

Orchard Notes

W. J. ALLEN.

April.

The outcome of the recent Conference of Ministers for Agriculture of New South Wales, Victoria, South Australia, and Tasmania, is that much better arrangements than have heretofore existed have been made for the importation and exportation of fruits, fruit-trees, and vegetables, and it was not the desire of any of the Ministers that any restrictions should be put on legitimate trade. South Australia still prohibits the import of grapes or grapevines, or any part of a vine, owing to the fact that there is no phylloxera in that State, but will allow fruit to pass through to Broken Hill, provided always that it has no disease which may spread to their orchards in transit. They reserve the right to inspect the same.

Victoria and New South Wales have come to a very satisfactory agreement, but fruit affected with fruit-fly is not allowed to be sent from one State to another. Tasmania admits our nursery stock, provided it is free from disease.

All fruits to be exported must be passed as being fit for export and reasonably free from disease, and a certificate must accompany them to that effect from the exporting State before they will be admitted to any State. Each State reserves the right to inspect all fruit on arrival, but it is hoped that the pre-export inspection will block much of the inferior and diseased fruits which, up to the present time, have been sent from one State to the other, and which has been the cause of all the friction between the States.

Mr. Hugh Calderwood, of Galston-road, Hornsby, informs me that he had recently fumigated some orange-trees, which had been sprayed with Bordeaux mixture a fortnight before, and had not damaged a leaf on the trees. I am of opinion that the heavy rains which fell between the time of spraying and the fumigating washed the bluestone off the trees. Had there been no rain in the meantime I fear the trees would have suffered.

Inspector Corrie reports that he found the following varieties of fruits were doing best on the rivers south of Grafton, viz.:—

Apples.	*Pears.*	*Grapes.*
Granny Smith.	Bartlett.	Isabell.
Newtown Pippin.	Gansell's Bergamot.	White Sherry.
Carrington.	Winter Cole.	Muscat of Alexandria

The latter two grapes take oïdium badly, and require an occasional spraying of Bordeaux mixture.

Green Manuring.—Although it is getting rather late in a good many districts to sow crops among the trees, it is, however, best to put them in as early as possible now rather than to miss the season. It is a recognised fact that soil cannot go on producing crops without the loss of a great amount of plant food which is required for the sustenance of the trees or vines, and hence it becomes necessary for growers to assist in replacing in as large a measure as possible the constituents so removed from the soil. One of the best and cheapest ways of doing this is the growing and ploughing under of green crops, such as clovers, vetches, peas, rye, &c., which help, not only to build up the worn-out soil, but also assist in keeping it in condition when once it has been put into a suitable state of fertility.

Liming Soil.—Lime may be applied in cases where the soil is found to require it, particularly where it is sour, or where it is very heavy or sticky. After making the application of lime, see that is well worked into the surface soil.

Destruction of Pests.—It is most important that our citrus growers should endeavour to rid their trees of all scales, either by fumigating or spraying, and this with as little delay as possible, as even after the scale is killed it takes some time for it to leave the fruit, particularly after fumigation. Fumigating tables may be obtained on application to the Department of Agriculture.

San José Scale.—Lime and sulphur solution, without the addition of the salt, is one of the best sprays for the destruction of this scale. The mixture to be applied about the time the buds begin to swell in the spring, and is made as follows:—Take 15 lb. of best lime and 15 lb. of sulphur to 50 gallons of water. The sulphur is put into 12 gallons of water, nearly at the boiling-point, after being mixed with sufficient water to form a thin paste; the lime is then added, and the mixture is boiled for forty minutes, keeping it stirred from time to time. The whole is then strained into a 50-gallon tank, which is thereupon filled with water. If one has a tank large enough to bring the whole 50 gallons to a boil, and apply while hot, I am inclined to think that this spray would be still more effective. Such a solution should not be so hard on the hands of the operator as when salt is added.

Codling Moth.—Bandages must still be kept on the trees, as even after all the fruit is removed, an occasional grub finds its way to the bandages. All props should be removed from the orchard, and any grubs adhering to them destroyed.

Planting.—Planting of citrus trees may be continued this month. When autumn planting is practised, care should be taken in handling such trees not to expose the roots to either wind or sun for any length of time. As there has been a good demand for suitable varieties of apples for export this year, growers of this fruit should, in planting, only put in such varieties as are found the most suitable for export, and remember that an apple which colours up nicely (preferably red), and which carries and keeps well, is the one to

grow; and also bear in mind that the grower who can supply a line of ten thousand cases of any such variety can easily find a buyer for same. Up to the present the trouble has been that exporters could get only a few hundred cases of a kind, and not in sufficiently large quantities to make it worth their while to exploit foreign markets. There is also a good demand for suitable varieties of good carrying grapes for export, and from information which I gathered while in the western part of the United States and Canada, a good market could be found there for considerable fruit during April, May, and June. Those who intend planting out new orchards should get the land cleared and subsoiled as soon as possible, and trees secured. In planting apple-trees, see that they are all worked on blight-proof stocks, as trees worked on such stocks can be easily kept free of the Woolly aphis.

When apples and pears are being pulled it is found necessary, when early shipments are being exported, to go over the trees two or three times, taking only such specimens during each picking as will measure $2\frac{1}{2}$ inches or more in diameter, and leaving the smaller immatured or uncoloured fruits to remain on the tree until they are in a fit condition for picking.

Valencia Late Orange budded on Seville orange stock.
Note the thick rind. Grown by Mr. L. W. Nicholson, The Oaks, Camden.

Farm Notes.

Hawkesbury District—April.

H. W. POTTS.

THE recent rains have been favourable for getting the land into good condition for the sowing of autumn crops. Advantage may be taken of the opportunity to conserve cultivated crops in the form of hay or ensilage now that there is plenty of grass.

Wheat.—Owing to the prevalence of rust, it is not safe to grow this crop for grain. The main sowings may be made for hay, and rust-resisting types should be selected as far as possible. This season a number of new cross-bred types that have succeeded well in the wheat-growing districts are being planted on an extensive scale. They include John Brown, Rymer, Thew, Plover, Federation, Comeback, Jumbuck. It is advisable to steep before sowing. Drill in at the rate of 45 lb. to the acre.

Oats.—For green feed the Algerian is the best. Sow about 2 bushels of seed to the acre. The main sowings for hay are made next month. An improved ration is made by sowing a few tares, say half a bushel, with the oats.

Barley.—Successive sowings may be made of Cape barley for green feed. Tares should be included where grown for dairy stock. This combination provides a more relishable fodder, and ensures a better balanced ration for milk-production.

Rye.—Emerald rye may be planted for green feed or green manure. It will thrive on light poor soil, unsuited for any other crop. Where grown for grain, the straw should be saved, as it is invaluable for bedding purposes, and, if not broken in threshing, is suitable for stuffing collars, &c.

Lucerne.—It is not yet too late for sowing this valuable crop. Have land as clean as possible, and broadcast at the rate of about 15 lb. of seed to the acre. Select prime clean samples, obtained from good lucerne paddocks. Light soils, if properly worked, will grow good crops of this plant, and no stock-owner should be without a paddock of it. It may be rather difficult to make hay of the late cuttings of old established crops, owing to heavy dews, cool weather, and showery conditions, but it makes good ensilage.

Maize and Sorghum.—The late sowings of these crops should be kept clean by the use of the cultivator until they are high enough to look after themselves. Towards the end of the month these will be ready for converting into ensilage.

Turnips and Swedes.—These crops will now be making rapid growth, and if thinning has not been done it should be pushed on as quickly as possible. This provides for well-shaped uniform roots, so essential for market purposes. A few late sowings may be made for stock feed. The swede is a valuable crop for a rotation, and, on large areas, may be grazed off by sheep; the land will be greatly benefited by the accumulation of manure from the animals.

Rape.—This valuable crop can still be sown. Given fair, moist conditions, few crops will pay to grow so well as rape for sheep and pigs. Drill in at the rate of 7 or 8 lb. to the acre. When cut or grazed lightly before it has matured, a second or third crop may be obtained from the one sowing. It is a deep rooter, and may also be utilised for green manuring. Successive sowings, at intervals of a few weeks, will provide a continuous supply of green feed throughout the winter months. This crop is also of great value for clearing lands of weeds; at the same time, it is necessary to give the rape a good start by having the soil in a fine condition. On large areas, it can be conveniently sown by means of the special broadcasting attachment to a cultivator.

Field Peas.—This crop may be planted either for green manure or for the pulse. Sow in drills about 2 feet 6 inches or 3 feet apart. It is also valuable for sheep, where it may be fed off in a similar manner to rape or turnips.

Sheep's Burnet.—This plant may be sown this month. It is a deep rooter, and, when properly established, will stand a good deal of feeding. It is invaluable for sheep.

Pastures.—Where it is intended to lay down permanent pastures, mixtures should be made up suitable to the soil and climate. It is getting late for sowing grasses; but, provided early frosts do not set in, sowings of prairie, rye, cocksfoot, and white clover will make good growth before winter. The English grasses will only succeed in the moist localities.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for February, 1908.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture (Saturation=100).			Evaporation (from Water Surface).			
Lowest	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	% of the year's Evaporation.
29·69 2 & 29	30·21 11 & 22	29·99	60·1 17	103·2 8	71·6	70·0	48 15	100 1, 2, 12, 23, 24.	77	·426 9	5·509	4·687	11

Rainfall...														
Points ...	213	162	73	1	58	20	27½	107	15	24	72	124	95	= 970 points.
Dates ...	1	2	3	6	9	12	13	20	21	22	23	24	25	

Mean for February for 16 years = 271 points.

Wind ...	N	NE	E	SE	S	SW	NW
	8	6	2	5	20	3	1

Thunderstorms, 18th and 19th.
Greatest daily range of temperature = 37·2° on 8th.
Days on which shade temperature rose above 90° = 103·2° on 8th.
The rainfall is the heaviest since July, 1904, and the fourth heaviest in 15 years.

W. MERVYN CARNE,
Observer.

Garden Notes.

W. SANDERSON.

APRIL.

Vegetables.

As most parts of the State have benefited by an abundant rainfall during last month, no doubt this will encourage many to grow a few vegetables who were unable to do so during the protracted drought.

If the land has been properly cultivated and manured this should be a very favourable opportunity to grow many kitchen garden products.

It is the easiest thing in the world to sow seeds or prick out seedlings from a seed-bed, and with a little attention they will make satisfactory growth. Seed, however, is often absolutely wasted by being planted too deep or in unsuitable land; also seedlings are sometimes transplanted into land poorly cultivated, with plenty of weeds in it, with the result that the plants go back instead of making vigorous growth as they should.

The difficulty with sowing seed in stiff soil can easily be overcome by planting them in beds or drills, as the case may be, with a covering of compost of good leaf mould, rotted dung, sand, &c., that has previously been collected. This is light, and will not crust when watered, consequently if the seed is sown a trifle too deep it will germinate, and the young plants find their way through.

When the young plants are ready for transplanting, this should be done on days (evening for preference), when the weather conditions are favourable. Before lifting them out of the seed beds give them a good watering, so that some portion of earth will adhere to the fibre of the young plant. Care should be exercised to press the soil firmly round the roots. When transplanting, the soil round the base of the plant should be left a trifle low, so that when watering later on the water will collect at the root, thereby ensuring plenty of moisture to the young plant. If the land has been previously well manured and cultivated, the growth of the plants will, with ordinary attention and subsequent watering and cultivation, be up to expectations.

In the warmer or coastal districts a sowing of beans, kidney or French, might be made to advantage, but in colder parts, where early frosts occur, perhaps it would not be worth the risk of planting; also, in the case of cauliflowers and broccoli, the season is, perhaps, a trifle late. Yet if a few good healthy plants were pricked out in well manured land they should at least repay for the trouble of attention.

Cabbage may be planted out, say, a few now and another planting in the course of a fortnight or three weeks, in quantities large enough to satisfy

the requirements of the household; also red and silver beet can be pricked out from seed-beds; but if seedlings are not available make a sowing for transplanting later on.

The weather conditions are very favourable for planting out celery, but it requires land that can command a good water supply, which is absolutely necessary to produce well grown stalks fit for the table, otherwise they will be stringy and useless.

Onions, eschalots, and garlic should be planted now in small quantities, and as salad is used on almost every table the following should not be forgotten :—Lettuce, endive, cress, mustard, and radish.

A few rows of peas can be tried, and when about 6 inches high they should have something to climb on in the way of sticks or brambles, as this prevents the pods lying on the ground, and the wind from destroying the haulms, as is frequently the case.

The following seeds may be sown :—Carrot, parsnip, cabbage, broad beans; also a stock of herbs should be looked to, as they are most useful in the kitchen.

Flowers.

As the season for planting spring flowering bulbs is getting late, no time should be lost in putting in hyacinths, daffodils, freesias, snowflake jonquils, anemone, ranunculus, tulips, &c., but, especially in the case of the hyacinth and daffodil family, the land should have been previously worked to a depth of 16 or 18 inches, and, if not naturally rich, a little bonedust or other fertiliser mixed through the ground before planting will feed the plants later on.

Dahlias and chrysanthemums should be kept tied up to protect the blooms and keep them from lying on the ground; any other flowering plants that require tying up should have attention.

For present planting, seeds of the following may be put in :—Pansies, carnations, gaillardia, antirrhinum, phlox, wallflower, daisies, verbenas, hollyhock, primula vulgaris (common English primrose), intermediate stocks (Beauty of Nice and Queen Alexandra are good kinds).

The lawn should receive attention now, as the grass grows very fast at this time of the year under favourable weather conditions. All weeds should be removed that have been introduced from time to time, thereby preventing unsightly patches; also, if continued showery weather prevails, worm-casts considerably spoil the appearance of the lawn. These, however, can be prevented by watering with a fairly strong lime-water, which will cause the worms to disappear.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Clarence P. and A. Society, Grafton	Thos. Bawden	Apl. 1, 2
Ulladulla A. and H. Association	C. A. Buchan	,, 1, 2
Durham A. and H. Association (Dungog)	C. E. Grant	,, 1, 2
Warialda P. and A. Association	W. B. Geddes	,, 1, 2, 3
Bathurst A., H., and P.	W. G. Thompson	,, 1, 2, 3
Walcha P. and A. Association	S. Hargraves	,, 2, 3
Campbelltown A., H., and I. Society	Fred. Sheather	,, 7, 8
Lower Clarence A. Society, Maclean	G. Davis	,, 7, 8
Moree P. and A. Society	D. E. Kirby	,, 7, 8, 9
Mudgee A. Society	H. Lamerton	,, 7, 8, 9
Cooma P. and A. Association	C. J. Walmsley	,, 8, 9
Upper Hunter P. and A. Association (Muswellbrook)	Pierce Healy	,, 8, 9, 10
Upper Manning A., P., and H. Association	D. Stewart, jun.	,, 9, 10
The Royal Agricultural Society of N.S.W.	H. M. Somer	,, 14 to 22
Narrabri P., A., and H. Association	W. H. Ross	,, 28, 29, 30
Dubbo P., A., and H. Association	F. Weston	May 6, 7
Hawkesbury District A. Association	C. S. Guest	,, 14, 15, 16
The Central Australian P. and A. Ass., Bourke	G. W. Tull	,, 20, 21
New South Wales Sheep Breeders' Association	A. H. Prince	,, 24 to 27
Nyngan and District P. and A. Association	R. H. A. Lyne	,, 27, 28
Deniliquin P. and A. Society	L. Harrison	July 18, 19
Hay P. and A. Association	G. S. Camden	,, 22, 23
Narandera P. and A. Association	W. T. Lynch	Aug. 5, 6
Young P. and A. Association	G. S. Whiteman	,, 8, 9, 10
National A. and I. Association of Queensland	C. A. Arvier	,, 10 to 15
Forbes P., A., and H. Association	N. A. Read	,, 12, 13
Parkes P., A., and H. Association	G. W. Peaborn	,, 19, 20
Murrumbidgee P. and A. Association	A. F. D. White	,, 25, 26, 27

Society.	Secretary.	Date.
Grenfell P., A., and H. Association	Geo. Cousins ...	Sept. 2, 3
Germanton P. and A. Society	J. Stewart ...	„ 2, 3
Albury and Border P., A., and H. Society	W. I. Johnson ...	„ 8, 9, 10
Molong P. and A. Association	C. E. Archer ..	„ 16
Cootamundra A., P., H., and I. Association... ...	T. Williams ...	„ 15, 16
Queanbeyan P. and A. Association	E. O. Hinksman ...	Oct. 1

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Agricultural Gazette of New South Wales.

Wheat-growing in New South Wales.

G. L. SUTTON,
Cowra Experiment Farm.

The Progress of Wheat-growing.

THE wheat industry in New South Wales at the present time is rapidly increasing in importance. Its condition resembles that of a healthy vigorous child who has emerged from the dangers of childhood and is developing into prosperous manhood. At first its progress was slow and irregular, but from 1861, when 123,468 acres were planted, the acreage under wheat steadily grew during the next thirty years, until 356,666 acres were planted in 1891. During the next decade progress was more rapid, for in 1901 the area under wheat for grain was 1,392,070 acres. In 1906 we reached the maximum area, 1,939,447 acres; but in 1907, owing to unfavourable conditions at ploughing time, the area was only 1,390,171 acres, but with good prospects and a favourable season we shall soon reach 2,000,000 acres. But even this is less than one-tenth of the area suitable for the growth of this crop within the belt having an average annual rainfall of over 20 inches, which is now known to be the "safe" area for wheat-growing. The expansion which is possible in the near future is obvious.

The slow progress which wheat-growing at first made in New South Wales was due largely to the use of varieties unsuitable for the warmer and drier districts. The wheats first used were those which the early settlers brought with them from the Old Country, and when the differences between the climate of England and that of New South Wales are considered, it is not surprising that these varieties were found unsuitable, or only adapted to the cold districts or the moist climates of the coastal areas. By degrees, new and more suitable varieties were obtained, and as these were secured wheat-growing spread into districts which before had been considered totally unfitted for that industry, and the rapid expansion of this highly profitable branch of agriculture during recent years came about. This expansion has been materially assisted by the adoption of new methods of cultivation and harvesting suitable for conditions in Australia, where land is cheap and where large areas are available, and also by the introduction of labour-saving machinery where labour is scarce and high priced.

That wheat-growing is highly profitable is shown by the comfortable homesteads and thriving financial position of innumerable families in those districts where wheat is king. A very gratifying feature of this prosperity is, that many of these wheat-growers are men who started with little or no capital in hard cash, and in many cases with but little practical knowledge, but have succeeded because of their ability and willingness to work. That such is the case is not altogether surprising

when it is known that in a favourable year a farmer will often receive for his crop more than the capital value of his land. Many instances could be given of men who started in a small way and who, after putting in their crop, had to leave home to earn the necessaries of life until the wheat was ready to harvest, but who now have steady incomes and own properties and plant whose value runs into four figures.

Climate and Rainfall.

In view of the fact that in the early days of the industry wheat-growing in New South Wales was confined to the moist regions of the coastal districts, which have an annual rainfall of 30 to 40 inches, it is interesting to note that the largest recent additions to the area under crop are lands on the Western slopes, where the average annual rainfall is 20 inches and under. The cultivation of wheat in the coastal areas has, indeed, now been practically abandoned on account of the prevalence of rust, combined with the discovery that the drier districts are suitable because the crop can be more easily and more cheaply grown. The bulk of the wheat is now grown in the districts bordering on the 20-inch rainfall, many of them having less. An average annual rainfall of 20 to 25 inches is considered ample for wheat-growing, and preferable to a heavier one. Actual results have proved the industry to be highly profitable in districts with less than 20 inches. A yield of over 37 bushels has been obtained with less than 19 inches in the year. What is of more importance than the actual inches of rain received is the period when it falls. Rain is most beneficial in the early autumn, to facilitate ploughing, and in the spring at the time when the wheat is heading and flowering; and falls at such times assure an abundant harvest. The wheat districts of the State are fortunate in benefiting by rain at these particular periods.

The very dryness of the wheat districts in summer, which at one time was considered fatal to their suitability for wheat, is now rightly considered one of their advantages, for such dryness is favourable for the production of high-class grain, and because of it rust need only be feared in unusually wet years, hay-making is facilitated, and the crop for grain can be left in the field until thoroughly ripe, when they can be harvested with special machinery and bagged ready for market at a cost of 4s. to 6s. per acre (excluding the cost of bags).

The yields in the dry districts of New South Wales are certainly not as large as in the moister ones, but the average return is about 11 bushels. When this is compared with the 32 bushels which is the average yield of Great Britain it seems alarmingly small; but such a return as is obtained in our dry districts leaves a very reasonable margin of profit, for the cost of production is correspondingly low. In such districts it is estimated that a crop of 8 bushels per acre, sold at 2s. 6d. per bushel, will pay the grower. The average return by no means indicates what the dry districts are capable of, for the yields of poor and unskilled farmers reduce the average for a district.

The Narromine district, one in which the most recent expansion is taking place, is in the Central Western plain, and has an average annual rainfall of about 20 inches. This district in the past has averaged 16, 18, and 20 bushels per acre; and as much as 40 bushels per acre from 600 acres and 25 bushels per acre from 3,000 acres have been obtained.

The temperature is certainly high at times in the summer (December and January), the thermometer during the hottest part of the day often registering over 100 degrees Fahr., but owing to the dryness of the air this heat can be borne with considerably less discomfort than can much lower temperatures in moister climates. For two or three months in the middle of the summer the conditions during the heat of the day may be trying, but during the remainder of the year the climate is ideal, the winters being so mild that stock need no sheltering, and even fatten on pasture during that season. The districts are remarkably healthy, and it is possible to live out of doors all the year round. Occasional droughts or periods of scanty rainfall are met with, but farmers are learning how to provide for them, and by new methods how to make the most of the moisture that falls, so that the injurious effects of drought are lessened, and in the future are likely to be still further reduced. Nature is usually so good that when she occasionally frowns folks are apt to be unprepared and to become alarmed. The climatic advantages of these districts far outweigh their disadvantages, and it is questionable, when all things are considered, whether many more desirable places for residence are to be found.

Classes of Land.

The wheat districts comprise all classes of land, from plain open country with belts of timber or scrub, to fairly open or timbered undulating or hilly country. In the open plain country the soil is chiefly rich black loam, which is not considered as suitable for wheat as the red friable loamy soil found on the timbered or scrub lands.

The quality of the land is very good, easily worked, and naturally drained; for several years profitable wheat crops can be grown in succession without manure, and with indifferent cultivation. In the districts now devoted to wheat-growing, it is likely that wheat will always be the principal money crop, and when it is grown in conjunction with the cultivation of oats, barley, rape, tares, peas, sorghum, and other crops suitable for stock feeding, there is not the slightest doubt that its profitable cultivation can be carried on for an indefinite period. The unimproved value of land in these districts ranges from £1 10s. to £2 10s. per acre.

Size of Farms.

With the implements now on the market, a good farmer can plant and care for 200 acres of wheat, and some hard-working energetic men manage 300 acres. In the settled districts, wheat farms range in size from 300 to 600 acres; but farms of one, two, and three thousand acres are not uncommon. When fenced, cleared, and provision made for water, they

may be put down as worth from £2 10s. to £7 10s. per acre, the value depending upon the improvements, and their proximity to the railway.

It is the exception to find wheat farms which have a natural permanent water supply. In some instances water is obtained by sinking shallow wells, but in the majority of cases the much needed provision is made by excavating tanks or dams in suitable low-lying sites, where the water from the catchment area can be led into them by means of drains or gutters. The general size of these tanks ranges from 1,000 to 2,500 cubic yards, costing from 7d. to 1s. per cubic yard to excavate.

Fencing.

The universal practice is to fence each holding, and in the majority of cases convenient subdivision fences are erected. The most common kind of fence consists of posts erected 9 to 11 feet apart, with six or seven wires running through them. The value of this fencing is about £28 to £30 per mile; the cost of the wire being from £8 to £10 per mile; the posts are usually obtained from timber on the property. The advent of the rabbit has rendered it necessary to wire-net the boundary fences, so as to exclude him, and prevent his depredations; this necessitates an additional expenditure for these fences of about £45 to £50 per mile.

A wire-netted rabbit-proof fence, two posts and six droppers per chain.

From Virgin Forest to Wheat Farm.

The ground is most commonly cleared of timber by first ringbarking the green trees, and allowing them to die, before fitting the ground for the plough by grubbing them out. Only in a few instances is the ground entirely cleared of green timber, as the latter method is very much more expensive than the former, and for some time after the removal of the green wood, the ground is in a sour condition, and not in the best state for the growth of crops. After ringbarking, the ground gradually sweetens as the trees die, so that by the time the timber is dead, the ground is in fit condition for cropping; and while the trees are dying,

the ground is used for grazing. The cost of clearing ground on which the timber is dead is only about a quarter or a third that of clearing land with trees growing on it.

Cost of Clearing.

There are various methods of ringbarking in vogue, but in a general way it may be described as the removal of a small strip of bark or sap-wood from around the trunk of the tree, so as to prevent the flow of sap from nourishing it and making fresh growth. After the trees are ring-barked, they generally throw out young shoots—"suckers"—below the ring from which the bark has been removed. The removal of these necessitates another operation, known as "suckering"; usually this has to be done twice, and sometimes three times before the trees are dead. The deeper the trees are ringbarked, *i.e.*, the thicker the strip removed, the sooner the tree will die: but the greater the tendency to produce suckers. Ringbarking costs from 9d. to 1s. 3d. per acre; the first suckering, 6d., and the second suckering, 4d. When the trees are dead, which is two to three years from the date of ringbarking, they are grubbed or burnt out, all roots within 12 to 18 inches of the surface being removed. The cost of doing this ranges from 10s. to 15s. per acre, so that in the wheat districts the cost of getting timbered country ready for the plough is about 17s. 1d. per acre, made up as follows:—Ringbarking, 9d. to 1s. 3d.; suckering twice, 10d.; grubbing, 10s. to 15s. The cost of clearing land in the green state ranges from £2 to £2 10s. per acre.

In some districts it is the practice to cut off the dead trees level with the surface of the ground, the roots below the surface being allowed to remain. This is known as "Yankee" grubbing, and is from 5s. to 10s. per acre cheaper than the ordinary method. It requires special "Stump jump" implements to cultivate land so cleared; but seeing that these are available on the market, there is something to be said for this cheaper method of clearing, as the yields obtained from land so cleared are not very much less than from land more thoroughly dealt with, and to a man with limited capital, the reduced initial outlay for clearing (either in hard cash or labour) is a consideration. The more careful farmers do not advocate this method.

Ploughing, Sowing, and Harvesting.

With regard to the cultivation of wheat, the general custom is to plough the ground as early as possible after the autumn rains fall in March and April, and then to plant the seed as rapidly as the ground can be prepared, until the end of June, when the planting season is considered over. A change is, however, now taking place, for it is generally recognised that better and more certain results are obtained when the seed is sown on land which has been fallowed and worked during the summer, so that the best farmers now make it a practice to plough at least part of their land in the early spring, allow the ground to lie fallow during the summer, and then plant at the usual time without reploughing, though in some cases where the ground is weedy it is reploughed.

The increased yields which invariably follow summer fallowing are conclusive evidence of its value in our wheat districts, and proves that it pays, despite the slightly extra cost incurred in preparing the ground. When the land is not fallowed, the operations connected with wheat-growing are usually (1st), ploughing; (2nd), harrowing (if crop is drilled, but omitted if crop is broadcasted); (3rd), sowing, either broadcasted or drilled; (4th), harrowing after sowing; and (5th), harvesting. When the land is fallowed a slightly different method is followed; then the ground is first ploughed in the spring or early summer, harrowed twice or three times during the summer, and perhaps disc-harrowed or cultivated to kill any weeds that may grow. At planting time the seed is sown without any further preparation, unless the ground, despite the cultivation, is weedy, when it may be reploughed.

Rolling.

In some cases the ground is rolled, either before or after sowing, and in others both before and after. Often the whole of the work done for the landowner is by contract. The rates ruling for the different items per acre are :—

Ploughing—New ground, 7s. ; old ground, 6s. ; fallowed ground, 4s. to 5s.

Harrowing—6d. to 9d.

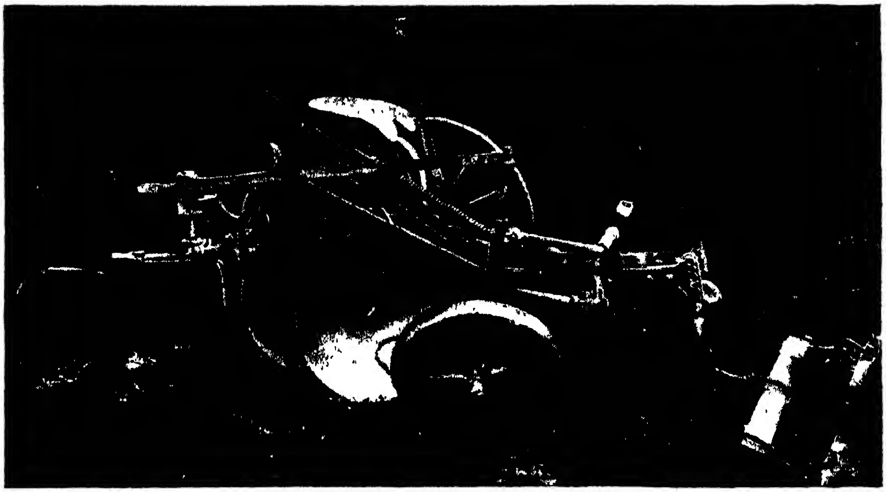
Sowing—Broadcast by hand, 7d. ; broadcast with machine, 4d. ; with grain-drill, 1s. 3d. to 1s. 6d.

Harvesting—Stripping and winnowing an 8-bushel crop, 4s. ; a 16 to 20 bushel crop, 7s. ; or if done with the reaper and binder—cutting, 3s. to 4s. ; twine (say), 2s. ; stooking, 9d. to 1s. Stacking and carting, 4s. 6d. to 5s. ; thrashing, about 4d. per bushel.

Various kinds of ploughs, both the mould-board and disc, are used; the size most favoured is the four-furrow, drawn by five or six horses, a team which an ordinary driver is capable of caring for. The depth

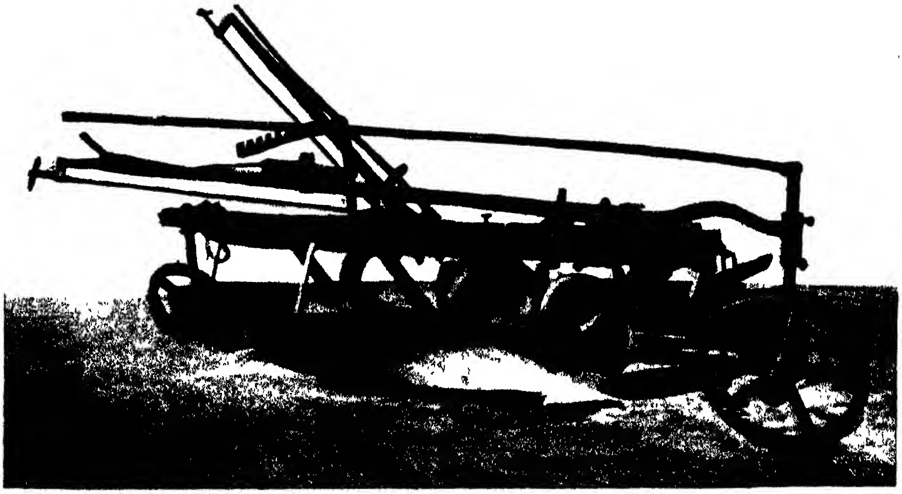
usually ploughed is about 4 inches, and rarely exceeds 5 inches; 4 to 5 acres is considered a day's work.

Harrowing is done with a set of three to six sections, covering from 12 to 20 feet; with them from 15 to 20 acres are done daily.



Double-furrow disc plough.

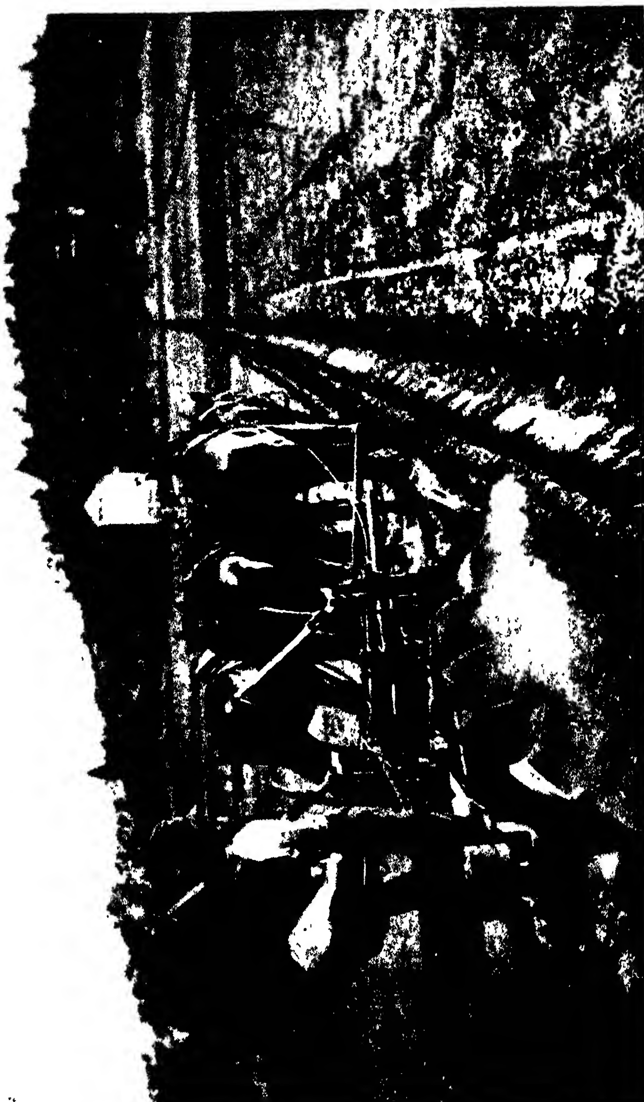
The almost general practice now is to plant the seed with a grain-drill, at the same time distributing with the seed from 40 to 60 lb. of superphosphate per acre. Both disc and hoe drills are in use, the sizes ranging



Double-furrow mould-board plough.

from twelve to fifteen tubes, and on some large farms drills having twenty tubes are used, the distance between the tubes being 7 inches. From 12

to 20 acres is an average day's work. A case is recorded where a farmer, whose sowing was delayed, had 500 acres drilled in twenty-four days with a thirteen-hoe drill; the drill was kept going night and day with relays of men and horses, the necessary light at night being furnished by means of acetylene lamps attached to the drill.



Disc plough at work.

In some few instances the seed is still sown broadcast, generally with a machine fitted to a cart or dray, the wheels of which operate the mechanism of the implement. Though this method is cheaper and more expeditious than drilling (with a broadcasting machine up to 100 acres

per day can be sown), it is gradually giving place to the drill, the use of which is now fairly general, as the amount of seed saved when the drill is used, to say nothing of the increased yield, soon pays for its initial cost, which is from £35 to £40. The amount of seed used is 20 lb. to 45 lb. with the drill, and 1 bushel and over when broadcasted.

Drilling.

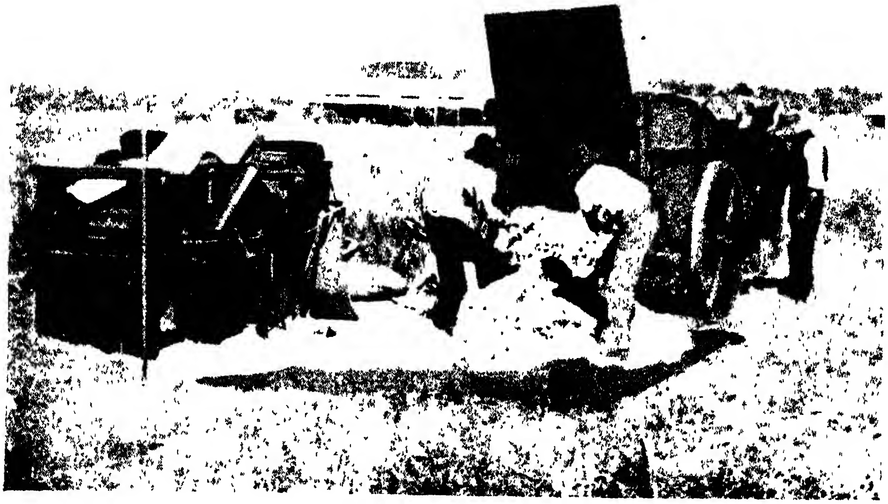
In some cases the crop or part of it is cut with a reaper and binder, but in the majority of instances it is allowed to stand in the paddock until perfectly ripe, when it is harvested with a stripper or stripper harvester.

Harvesting Machinery.

The "stripper" is purely an Australian invention, and is a machine drawn through the ripe standing crop by three or four horses attached to its side, which walk in the stubble of the harvested portion. By means

Stripper at work.

of a comb the ripe ears of wheat coming within reach of the machine are gathered and directed to the cutting-plate, where the beater-drum cuts them from the straw and thrashes the grain out; at the same time the grain with the chaff and a small quantity of straw is deposited in a box-like receptacle at the back of the machine. This box holds about 8 bushels of grain and its accompanying chaff. When the box is full the machine is taken to a convenient place in the paddock and there emptied. Here a winnower or cleaner is situated: the mixture of grain, cavings, and straw is put through this winnower, which cleans the wheat and bags it ready for market. In fair crops, one winnower with four men to work it and



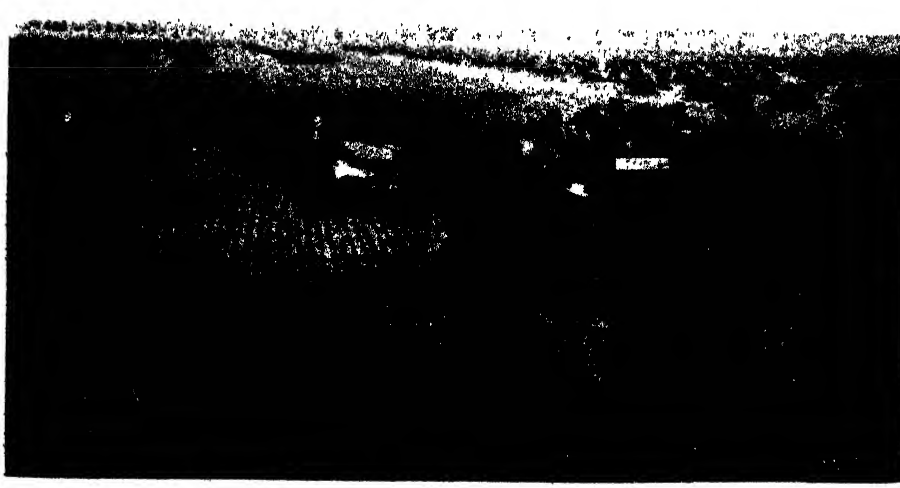
Emptying the Stripper.

sew the bags will keep two strippers going. In some cases the winnower is driven by a horse-tread power, and then one winnower keeps as many as five strippers going. Stripping starts in the morning about 8 a.m., and is continued throughout the day until about 7 p.m. A man with two three-horse teams, each team working about three hours at a time, will strip in a fair crop about 10 acres, yielding from 40 to 45 bags (180 bushels) per day. Cases are common where over 80 bags (320 bushels) are stripped in a day, and one case is known where one driver with his machine stripped 96 bags (over 384 bushels) in one day.

The "Stripper Harvester" is another Australian invention, and an improvement on the simple stripper. Built in as part of the machine is a winnowing attachment, on to which the thrashed but uncleaned grain

is delivered as the machine is drawn through the crop. This implement, in addition to harvesting the ears and thrashing the grain from them,

Winnowing.



Harvesting with Reaper and Binders.

as in the case of the stripper, winnows it and delivers it in bags at the side of the machine ready for market, thus considerably reducing the cost of harvesting and, in addition, enabling the farmer to dispense with a certain amount of outside labour, which is extremely difficult to obtain at harvest time. The Stripper Harvester is a wonderfully compact machine, and though only introduced a few years ago has rapidly grown into favour. The comb-gathering device in these implements is 5 to 6 feet wide, and in order to prevent damage to the unharvested crop the machine is drawn by the horses which are attached to the side. This method of attachment causes a certain amount of side-draft, which in the past has prevented the combs on these machines being made wider than that stated. Quite recently, however, a new implement has been patented, in which

Thrashing Wheat.

the horses are attached to the rear of the machine and push instead of drawing it, as is usually done. This implement is called the "Push" harvester, and because of the position of the horses the side draft is practically eliminated, and in consequence the comb or gathering device is made twice as wide as in the ordinary harvester or stripper, thus a very much greater area can be harvested per day with one of these machines without a corresponding increase in the amount of manual labour required. The harvester is worked by two men, one of whom drives the horses and attends to the machine, the other adjusts and removes the bags and sews them up. The area dealt with by the harvester is about the same as that dealt with by the stripper.

(*To be continued.*)

Some Notes on Sisal Hemp.

H. V. JACKSON.

SISAL hemp is one of the fibres scheduled under the Commonwealth Bounties Act.

The fibre is obtained from the plants of the Agave species of plants.

At the Experiment Farm, Wollongbar, Richmond River, specimen plants were under cultivation at the time the writer was Manager of the farm—from 1898 to 1901. A considerable area was under *Bœhmeria nivea*—China grass or Ramie, and small plantations were formed of *Musa textilis*, Manila Hemp, and *Agave rigida* var. *Sisalana*, Sisal hemp, and plants of *Sanseviera lanuginosa*, Bowstring Hemp, and *Fourcroya gigantea.*

Various vernacular names are given to plants of the Agave species. One authority expresses the opinion that the fibre plants of the Agave family were known to the Haitians comprehensively as "Henequen," and according to another writer it would seem that the word "Maguei" or "Manguai" also belonged to the native language of Haiti The Spaniards apparently took the names Pita and Maguey with them to the mainland and applied the name to the Agave which they found cultivated on the tableland of Mexico. In consequence of the number of vernacular names, some confusion has arisen as to the varieties of Agave they may specifically refer to. Baron von Mueller says of *Agave rigida,* it is "the Chelem, Henequen, and Sacci of the Mexicans furnishing the Sisal hemp. The leaves of the Sacci or Sacqui give the largest returns. The yield of fibre begins in four or five years and lasts for half a century or more, the plant being prevented from flowering by cutting away its flower stalk when very young. The fibre is straight, glossy, and strong, particularly well adapted for ropes, as resisting dampness. The leaves are from 2 to 6 feet long and 2 to 6 inches wide."

In notes on Agave and Fourcroya in India by J. R. Drummond and D. Prain, the description given of *Agave sisalana,* the true Sisal, is as follows:—

Leaves 20-35, oblong-lanceolate, never forming a rosette, but closely tufted on the rhizome or on a very short ascending caudex which is completely hidden by their moderately thick bases, the inner making a very sharp angle with the axis, the outer gradually receding but still making less than a right angle, neck not at all constricted; colour deep green, sometimes glaucous; up to 6 feet long, breadth at the widest part which is just above the middle reaching 10 inches, margin with or without prickles, which, if present, are weak, scattered, and pale coloured, terminal spine not channelled. glossy, purple or dark brown; scape 15 feet or more with the panicle, fascicles of blossoms rather crowded, germen equal to or shorter than the perianth slightly broadened upwards, base of perianth convex and somewhat dilated, limb suddenly contracted narrowly ligulate tip slightly hooded, style long, very faintly lobed, early protruded. (Capsule not available.)

India.—Introduced into various parts of the country between 1885 and 1892. Cultivated in Burma, Cachar, and Sylhet, Assam, Bengal, North-West India as far as Lahore, Central India, Bombay, Deccan (Poona), Mysore, Madras.

Distrib.—Native country unknown; introduced from cultivation in Yucatan in 1834 to islands (Keys) off the peninsula of Florida and there naturalised. Introduced into the West India Islands partly from Florida, partly from the American continent. Supposed by Schott and Engelmann to be derived from a wild species, but further evidence as to Yucatan species is wanted; there appear to be several in cultivation there. Cultivated in Australia, Fiji, Hawaii, and German East Africa.

In India this species varies as regards presence or absence of spines on the leaf margins. We have seen spines fully developed, spines partially and irregularly developed, and spines altogether absent on leaves of the same individual plant.

In 1892 Mr. Fred. Turner, F.L.S., contributed an article to the *Agricultural Gazette*, wherein he quoted various authorities on the cultivation of Sisal hemp, likewise giving some of his own experiences.

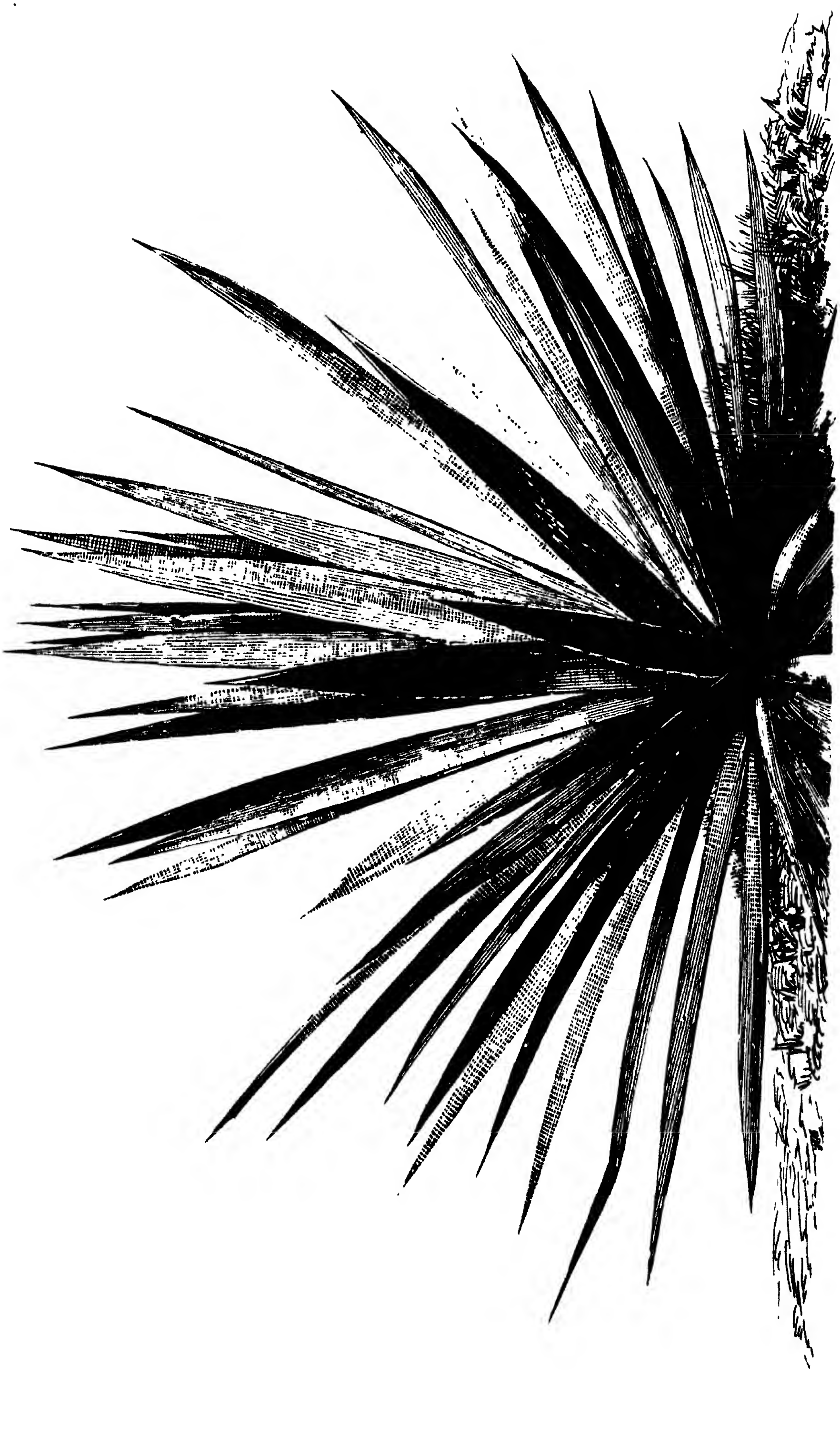
The following are extracts from his article:—

Soil, Climate, and Culture.

The frost line marks the limit of safe cultivation. The majority of writers state that arid, rocky land is best suited to the growth of the plant. The soil of Yucatan, where the Sisal fibre of commerce is produced, is described as a gravelly, stony, and, in some places, of a rocky character, the plants thriving best and yielding the largest amount of fibre in comparatively arid districts only a few feet above the level of the sea. And a moist or rich land is considered unsuited, because of the lesser yield of fibre which would result. Mr. Rauson says:—"The fact of the plant itself flourishing better may be attributed to a combination of conditions existing both in the soil and surrounding atmosphere, principal among which I notice the presence of salt, making it retentive of moisture, and of lime phosphates, resultant from decaying shells. Land bordering on the Atlantic coast, which is evidently alluvium of a comparatively recent date, is generally considered too poor in the constituents necessary to plant-life to make it worth while to attempt any cultivation upon it; and whilst this may be true as regards a lack of decomposed vegetable matter, yet the shelly saline sands will be found to suit such plants as the *Yuccas*, *Agaves*, &c., both chemically and physically, better than the rich black hummock lands."

From my own observations, I do not favour those arid, rocky situations "where nothing else will grow," and which are so often advocated. In fact, I should say the two extremes should be avoided. I saw on the Perrine Grant Sisal plants that were growing on a stone wall, but I could not help noticing that those growing on the higher part of this wall were less thrifty and of a much lighter colour than the plants on another portion where the wall was broken down. There is no doubt but that in rich garden-soil very long heavy leaves would be produced, but it is a question whether the yield of fibre would be greater than in the less thrifty leaves, with the disadvantage of a greater weight of pulp and water to handle in extracting the fibre. Some tests should be made to settle this question. In the Bahamas they do not favour this arid-land theory. In a recent report on the Bahamas fibre industry, made by Mr. James M. Rae to the Governor, Sir Ambrose Shea, my own observations in Florida are confirmed. Here is the extract—"I have both read and heard it broadly asserted that Sisal will grow and flourish anywhere, no matter how sterile or impoverished the land may be. My observations, however, do not confirm this. I do not mean to convey the idea that really good rich land is necessary for its successful cultivation, but merely to remove the impression, if such there be, that the plant will thrive in dry, arid sand, or on rocky land void of soil. Worn-out 'provision' and pineapple fields appear to be well suited to its cultivation; while on broken, rocky surfaces, containing innumerable 'pot-holes' and crevices in which is deposited the ordinary black or red earth, the plant luxuriates. Nowhere have I seen it appear more flourishing than on such lands. Certain kinds of white sandy land, found in large quantities at some islands, also suit it admirably. One of these varieties, white on the surface from being bleached by the sun, on being turned, disclosed a dark-coloured mixture resembling salt and black pepper, and is known locally by the term 'salt and pepper land.' Another still darker-coloured sandy soil is termed 'mixed' land. Yet another kind which, although white on the surface, is found to be of a reddish colour an inch or two below, is very fine and close. These varieties doubtless possess some organic matter, and are not to be confounded with the loose, coarse sand found in scrubby plains and bay ridges, producing a natural growth of stunted palmettos and low brush, and on which nothing else will grow."

It is claimed that beyond clearing the land of all growth, cutting out trees, and grubbing out stumps and roots, no soil preparation is needed. With the ground clean, weeds can be removed in the spring without trouble, and after the plants are well established no other weeding will be necessary.



SISAL HEMP.

AGAVE RIGIDA, MILLER, VAR. SISALANA.

Mr. Edgar M. Bacon gives the Bahamian practice as follows :—"All the ground is gone over first with the machete, a long heavy cutlass-like knife, which the negro uses either as a tool or a weapon. All trees and underbrush are cut down, except the very large ones, which require an axe. Then the stumps are grubbed up, so far as they are likely to interfere with the work. Next, fire is employed, and quickly runs over the acres where the negroes have toiled in gangs with their cutlasses. When at last all the clearing and planting have been done, and thousands upon thousands of perfect plants in absolute symmetry of arrangement, with unbroken ranks, their rich green showing no blemish, stretch before the eye, the spectator (especially if he happens to have a financial interest in the plantation) feels that there is a beauty apart from mere picturesqueness."

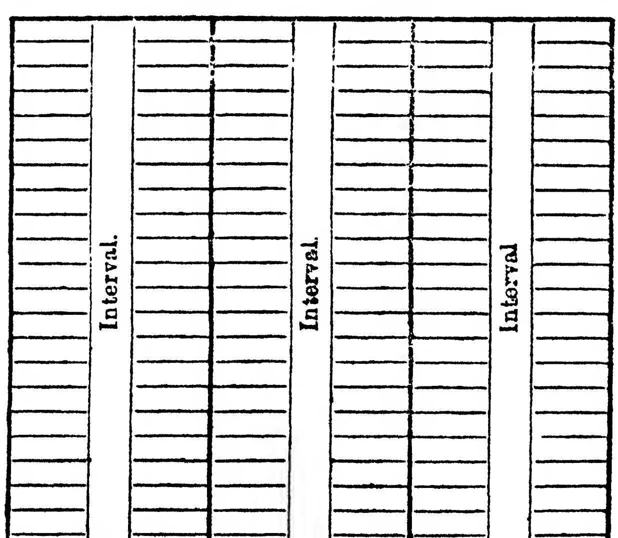
There seems to be a great difference of opinion in regard to the proper distances apart that the plants should be set. In the Merida district of Yucatan they are set in rows 9½ feet apart, and 6½ feet in the rows. According to the Bahamian Government report made by Mr. Preston, several years ago, the distance in old fields is stated at 9 feet between the rows, and 4 feet in the row. Experience has shown, however, that when planted too closely the leaves are injured by being beaten together in high winds, consequently 11 by 6 and 12 by 6 was considered sufficiently close, requiring from 600 to 650 plants per acre.

Regarding the actual practice in the Bahamas, let us again turn to Mr. Rae's report, published in 1891 :—"The system adopted by those who have engaged largely in planting, varies. Some have planted as near as 6 feet each way ; others 7 by 7, 7 by 8, 7 by 9, 8 by 9, and 9 by 9. The Munroe Company, at Abaco, plant three rows 8 feet apart, with 7 feet interval between the plants, and leave a space of 12 feet between every fourth row. The Bahama Hemp Company (Limited), which is under the efficient supervision of Mr. Abbott, plant four rows 8 by 8, leaving a distance of 12 feet between every fifth row. Most planters, however, have found it advisable, owing to the rocky nature of the land, not to observe too strict regularity in planting ; but, while adhering as near as practicable to it, to put plants in the most favourable spots. Most of the labouring class who have engaged in planting have observed no method at all, but have put the plants in the ground wherever a good "pot-hole" or chink in the rock occurs, and have planted much too thickly.

In Mexico the plantations are set out with more regularity, and in fact with the same system, as a rule, that is followed in this country in setting out an orchard.

Mr. Stoddart, who has had much practical experience in planting Sisal, both in Yucatan and in Jamaica, recommends the accompanying plan for laying out a field of (say) 31½ chains square :—

A B C D



E

Plan of a field.

The field is divided into three sections, each of which measures 10½ chains, and is represented as follows :—A to B first section, B to C second section, C to D third section ; in the middle of each runs an interval of proper width having a depth on either side within each section of about 5 chains. The short lines drawn across indicate the rows of hemp between which the cutter works, and therefore has—while cutting in any section—a distance of not more than 5 chains to carry the leaves to the interval, where the cart gets loaded. Each section has its boundary line, as is shown from B to E. It will be found, if this plan is adopted, how much the carriage of the leaves is facilitated, being done quickly to the great interest of the cultivator.

In the Bahamas many growers utilise the spaces between the rows of plants with other crops, even corn and cotton being named. The plan will work well enough, provided the matter is not overdone, weeds are kept down, and the cost of keeping the land clear lessened. Sweet potatoes, however, must never be planted, as they cover soil and Sisal plants alike, to the great injury of the latter. Shade is particularly bad for growing Sisal plants. During my recent visit to Florida the bad effects of shade upon large plants was noted in several marked instances, the plants being less thrifty, and the leaves sometimes so spindling and thin as to have lost their rigid habit, and to be bent and drooping. In Mexico, according to an official publication, henequen plants receive two dressings the first year, and one every year afterwards.

Upon the subject of cultivation and care of the plantation, Mr. Edgar Bacon, writing from the Bahamas, makes the following pointed suggestions :—Experienced growers use 650 plants to the acre, in rows 11 feet by 6 feet distant from each other. This will give room for the labourers to walk between the rows without being wounded by the terrible spurs, which, like a cluster of keen spears, make each plant a menace to the unwary. Besides this, the closer planting would result in the piercing of innumerable leaves every time the wind blew, and the consequent destruction of much fibre. Stabs and bruises mean discoloration, and the expense of sorting damaged lots, apart from the proportional loss would be an added and not insignificant item in the labour account of a plantation. Many people who have caught the Sisal fever are planting acre after acre, expecting nothing less than that the farms, when planted, will take care of themseves. To be successful in this enterprise requires unceasing activity and care. One must be Argus-eyed. One season of poor prices, with the consequent discouragement which is apt to follow in the case of nine small proprietors out of ten, in a country where the peasantry are all negroes, will result in an overgrowth of suckers and the poling of mature plants, till nothing short of absolute clearing and starting anew will save the farms. There is no cultivation where system and perseverance are more necessary to success. The dropping of a seed from a single "pole," if not watched and attended to immediately, will produce little spears enough to destroy a hundred plants, and I have frequently seen a dozen suckers start up around and under the leaves of their parent. After such crowding the leaves would be worthless even could they be reached; but no man, unless arrayed in metal armour strong and stout enough to withstand the thrust of steel, would be so foolhardy as to attempt to penetrate such a growth. What I want to impress is the fact that without that patient and systematic care which I have nowhere observed as characteristic of the unled negro, a field of Sisal is as valueless as a field of mullein.

All suckers should be removed, as they are a detriment to the old plants, and when they are not needed for planting new fields they should be thrown away. In planting them out in Yucatan, a little hole is dug and the plant introduced, after which it is propped up by a few stones and left to take care of itself. In setting out these suckers in the nursery, in Florida, they are placed 10 to 12 inches apart in rows. The plants are reproduced in two ways—by means of the suckers, which form about the bases of the mature plants; and by means of the "pole plants," which form upon the branches of the blossom-stalk or "pole" (sometimes called a "mast") after the tulip-shaped flowers have faded and fallen.

In Florida the age of maturity of a Sisal plant in the wild state is six or seven years. At this time the plant blossoms, sending up its flower-stalk or pole to the height of 15 to 20 feet.

After the tulip-shaped blossoms have begun to wither, there now starts forth from the point of contact with the flower-stalk a bud, which develops into a tiny plant, which, when grown to the length of several inches, becomes detached and falls to the ground. Such "pole plants" as come in contact with the soil take root, and in a very short time are large enough to transplant. A single "pole" or "mast" produces from 1,000 to 2,000 plants, while only a few suckers are formed at the base of each old plant. The largest pole plants that I saw in Florida measured about 4 inches in length. But among a lot received from Mr. George Bier, and that had never been in the soil. was one which measured 10 inches.

In regard to the flowering of the plants in the field, some writers state that the appearance of the pole should be watched for, and the stalk cut out to prevent

blossoming, as the plant then withers; while others state that because this indicates old age and the end of the usefulness of the plant, there is no advantage in attempting to save its life further. From the experience of Bahamian planters, not only does the cutting of the leaves retard the period of poling, but it also lessens the size and productiveness of the pole.

In Yucatan the period of usefulness lasts from six to eight years—sometimes from fifteen to twenty years—a plant fifteen years old presenting the appearance of growing at the top of a long foot-stalk several feet from the ground.

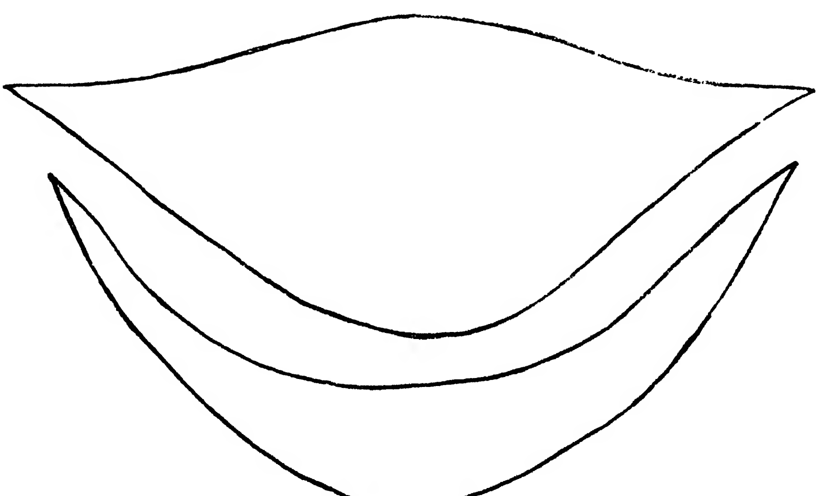
Yield per Acre.

A plant set out when 18 inches high will produce leaves fit for cutting in three years. The lower leaves, naturally, are the most mature, and cut first; these should be at least 3 feet long. Mr. Cleminson informs me that the average length of the leaf from four-old plants, as grown in Florida, is 3 feet 3 inches when cut, and for three years afterwards 6 inches longer each year. He also states that thrifty plants at seven years will produce leaves 5 feet in length; and if the flowering stalk is cut when it first makes it appearance the plant will continue to grow to profit for twenty-five years.

Mr. Ranson, of Titusville (the Indian River region), set out plants in 1887 that were 6 to 8 inches high. At two years the leaves of the large plants were 2 feet 8 inches long, and at three years the leaves were 3 feet 2 inches long, and were fit to commence cutting. The result of one plant here of two and one-half years' growth is an average of seventeen young plants and ten leaves sufficiently long to harvest. And he states that in the fourth year such a plant will give a still larger result, increasing in usefulness each year until it flowers, in its eleventh to thirteenth year, which ends the life of the plant.

I saw plants on the West Coast, said to be only four years old, the leaves of which measured over 5 feet long. I think, from the above statements, the plant must be of slower growth in the Indian River region than in more tropical Florida.

The late Mr. Van Buren stated that the product of nine hundred plants to the acre in the third year, allowing for two or three cuttings of five leaves each, equal to 12 or 15 lb. to the plant, would be 6 or 7 tons of green leaves to the acre, worth, at least, $3 per ton. He estimated the yield for the following year at 18 tons of leaves, from five or six cuttings, worth about $50 per acre. In the report of Mr. Preston it is stated that in Yucatan a leaf 4 feet long weighs 1·1 lb., and measures in the widest part 3¾ inches across from spine to spine, and is one-fourth of an inch thick in the centre of the leaf, 2 feet from either end. A similar leaf from the Bahamas is said to weigh 1½ lb. and to measure 4½ inches wide, and five-sixteenths of an inch in thickness.



Cross sections of a leaf.

Outline drawing, made from a freshly-cut Florida Sisal leaf, 5 feet 8 inches long and 5 inches wide, to illustrate the thickness and shape of the leaf (cross-section) at base and centre or widest portion. It may be stated that the full-grown mature leaves of Florida plant (var. *sisalana*), 5 feet in length, will weigh 1¾ to 2 lb.

Regarding yield, size of leaves, &c., in the Bahamas, Mr. Rae, in his recent report, makes the following statements :—The length of time required for the production of the first cutting of leaves may, I think, safely be regarded as four years from the time of planting. A great deal depends upon the size of the plants when transplanted ; but if they be of a suitable size, say from 12 to 15 inches, without doubt the leaves will attain a length of from 4 to 5 feet, and be fit to cut well within the period named. I have seen thousands of plants with leaves from 2 to 3 feet long that have been growing only two years. I have also seen plants, that I was told were three years old, from which leaves had already been cut. For the present, the yield per acre with us can only be a matter of calculation, in consequence of the industry having been so recently begun, but sufficient positive experience has been derived to determine this point with approximate accuracy. The number of leaves cut from many plants of four years' growth and upwards has given an average of 40 leaves per tree, with an average weight of 1½ lb. per leaf, and a yield of 4 per cent. of cleaned fibre. With an average of 600 plants to the acre, and 40 leaves weighing 60 lb. to each plant, the yield would be 36,000 lb. of leaf and 1,440 lb. of cleaned fibre. If the estimate be reduced to 35 leaves, there would be 31,500 lb. of leaf, and 1,260 lb. of fibre, and this is certainly a very modest estimate. To guard against all possible disappointment, however, the yield per acre can safely be placed at half a ton.

Mr. Bier finds that while the Florida fibre is somewhat finer in texture, it is longer and stronger than that grown in Yutacan, and the weight of fibre in the leaf is a fraction more in weight, the average per leaf of Yucatan being 490 grains, while ours averages 520 grains, with less moisture.

Tramway in a Plantation in Yucatan.

According to Mr. Preston's report on the Bahamian culture, forty leaves may be cut annually from a mature plant, at the average of 1½ lb. to the leaf. On the basis of 650 plants to the acre, this yield gives a total of 39,000 lb. of leaves, or 19½ tons. Mr. Preston calls it 19 tons, and at the rate of $2.50 per ton (the value of the green leaves before cleaning), we have $47.50 per acre, or almost double the value stated by Mr. Stoddart. On one of the farms visited by Mr. Preston in Yucatan, 48,000 leaves, or 72,000 lb. (36 tons), of crude material was cleaned daily. A yield of 5 per cent. of fibre, which is his estimate, gives a little over 1¾ tons of fibre per acre from the 36 tons

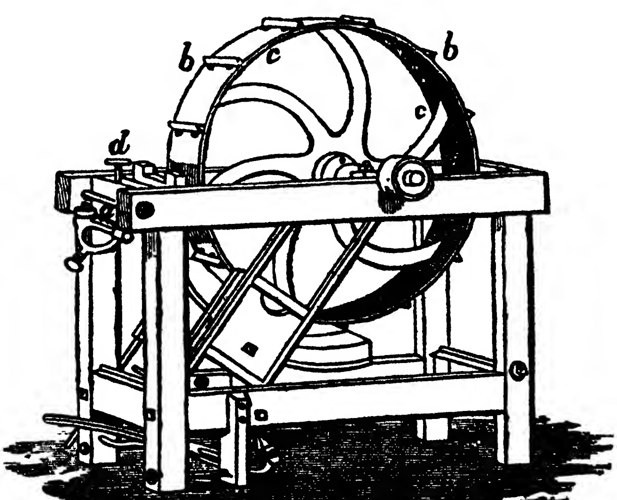
of leaves. Here are Mr. Preston's estimates, based on figures of yield in Yucatan, with cost of labour in the Bahamas.

48,000 leaves (36 tons) at $2.50 per ton	$90.00
6 wheels, each two hands, at 48 cents	5.76
3 boys supplying feeders, at 24 cents...	.72
3 women to remove and hang fibre, at 30 cents	.90
Engine-driver at $2	2.00
Fuel	2.00
Incidentals	2.00
Total... ...	$103.38

This shows a yield of 3,600 lb. of fibre from 72,000 lb. of leaves, at a cost of $103.38, making an average of $2.87 as the cost of producing 100 lb. of fibre, the product of 1 ton of leaves.

Mr. T. Albee Smith informs me that 1,000 leaves of henequen weigh in the rainy season 160 to 200 arrobas (25 lb. each); in the dry season 100 to 160 arrobas per 1,000 leaves. One thousand leaves average a yield of 55 lb. of fibre.

The leaves are cut close to the trunk, a sharp knife being used for the purpose. In Yucatan the spines are removed from the edges of the leaf, together with its thorn-like point, after which fifty leaves are tied together to form a bundle. About 1,500 leaves, making just a cart-load, are considered a day's work. A correspondent of the *Farm Implement News*—a Chicago gentleman interested in the Sisal industry—thus describes the method of harvesting in Yucatan:—"This is done by the Indians, who are almost nude, with a stroke of the knife or *machete*, at the rate of, for one hand, 2,000 to 2,500 leaves per day. Following the Indian who cuts off the leaves is an Indian woman, who, with a knife, cuts off the spike or thorn-tipped end and the thorny side of the leaf, ready for the machine. One foreman was understood to say that it costs about 38 cents per 1,000 leaves, to cut, prepare, and get the leaves to the cleaning machines. On all the large haciendas visited were little railways into the fields, upon which, on cars drawn by mules, the henequen was taken to the mill, and the waste was taken away."



Raspador.

Preparation of the Fibre.

The cleaning of the fibre of Sisal hemp in an economical manner after the leaves have been grown is probably one the chief considerations in the establishment of this industry. Until very recently the only machine in use in Yucatan was a clumsy affair, stated to be a native invention, called a raspador. Rude as this piece of mechanism is, it is said that a native will clean twenty leaves a minute with it, though with quite a percentage of waste of fibre.

While the raspador is said to have been superseded on some plantations, it is more or less generally used at the present time for extracting the immense quantities of Sisal hemp exported. The average work of one machine is claimed to be 7,000 leaves per day, with two feeders or operatives.

For the following interesting particulars I am indebted to Mr. Stoddart's pamphlet:—

Bagasse.—The bagasse or refuse from the leaves must be taken away by cart to some distance from the works, and should not be thrown around trees nor beside plants, which are of service, as it very soon kills them; no grass or anything else grows where this refuse is put; it destroys for a long time all vegetation, until its power gets worn out. It must not be made into heaps, but spread out thinly to get dry, so as to be burnt.

Drying the Fibre.—The fibre is, immediately after extraction, taken and hung on the drying-stand, where it is allowed to remain in the sun, and attended to by turning until perfectly dry, which occupies only a couple of hours. If the state of the weather prevents the fibre from being entirely dried in the sun, it must be put in the drying-house; in case of rain, the proper effort must be used to secure all the fibre in the house before the downfall, as rain-water will so injure it by discolouring as to make it unfit for sale, resulting in loss. Artificial drying is necessitated when the work goes on, and no chance of having the fibre sun-dried in consequence of the inclemency of the weather during long rainy seasons.

Bleaching.—The colour of the fibre, after being dried in the sun, is of a light straw or cream, but where the planter desires to improve this and to put his hemp in the market purely white, in order to gain fame, he may adopt the course of bleaching. This is done by first having the fibre perfectly sun-dried, and then allowing it to remain on the stand all night to get the dew on it, and during the next day until it gets entirely dry and free from all dew by means of the sun, not omitting to turn constantly; requires particular care and attention. This process causes a shrinkage, making it weigh less than it does when cured in the ordinary manner.

Baling.—This is conducted in the following manner:—The exact weight of fibre for one bale, according to the capacity of the press, is first weighed off; this is done with each successive bale, to have uniformity of weight. One or two hands get inside the press, and the fibre is handed to them by one or two others, laying it out smoothly and straightly, and then doubling over about one-third of its length to form a smooth head, which must be put flush to the head of the press, the long portion going the length-way; the packers standing on each layer in succession until finished, making it one bulk throughout. It is then screwed down, corded across tightly with small cords made from the same hemp, and ultimately thrown out. The baling must not be done by simply flinging in the fibre, making hills and holes, but neatly packed in order that the bale may have a smooth and neat appearance when turned out, which makes it pass for what it really is, hemp of the first quality—as badly put up bales, turned out rough and full of fringes, through their ugly show, although a hemp of first quality, is put down second class. Instead of a screw press a hydraulic press may be used, which will be an advantage. Any hemp which may, by way of accident, be damaged, either by the leaves remaining too long after cutting to be cleaned, or the fibre getting wet, or otherwise, the consequence of over-ripe leaves, all of which will give it spots and totally discolour it, must on no account be packed within the bale of white hemp, neither must it be made into cordage to cord up the bale, as it will in the first place destroy the fame it ought to have, and in the second injure the appearance of it.

Coming to information of a more recent date, in a bulletin published by the Manila Merchants' Association, Manila, Philippine Islands, under the head of "Maguey," the following statement is made:—

Maguey and Sisal hemp are two fibres obtained from closely allied species of the same genus of plants. Both Maguey and Sisal hemp can be profitably cultivated in nearly all parts of the Philippine Islands. Maguey is now being extensively planted in many different provinces, and nearly half a million Sisal plants have been imported into the Islands and planted during the past year.

The production of Sisal hemp within a period of comparatively few years, has made Yucatan one of the richest States in the Republic of Mexico. This industry has had a remarkable development, and the demand for Sisal hemp is steadily increasing. The imports of Sisal hemp into the United States, as shown by the following figures, indicate the growth of the industry:—

Imports of Sisal hemp into the United States—

1894	48,468 tons;	value, $3,742,073
1904	109,214 tons;	value, $15,935,555

These figures show an increase in the value of the imports of this fibre of 328 per cent. in ten years.

The Philippine exports of Maguey fibre have increased from 875 tons in 1901 to 2,328 tons for the first nine months of 1906. This fibre is now the export product of fifth importance in the Islands.

The essential feature of the Maguey industry, and that which recommends it to the Philippine planter, is its adaptability to the conditions prevailing in many parts of the Islands. Maguey flourishes in localities where there is insufficient rainfall for abaca*; it can be profitably grown on soils that will not grow sugar, rice, or corn; its cultivation requires but few draft animals, and comparatively little labour; and there are several improved machines for the extraction of the fibre.

Maguey has an advantage over Abaca in that it cannot be blown down or uprooted by violent winds, and it has no known insect enemies of importance. These plants will grow well even in fissures of bare limestone rock, and the ideal Maguey soil is a light loam composed of leaf mould and decomposed limestone. If fragments of undecomposed limestone are present in abundance, so much the better. Splendid Maguey plants are growing in pure beach sand on the coasts of Mindoro and Tablas. The cultivation of the soil is not necessary before planting. It suffices to clear away the brush and grass with the bolo, and after planting to repeat this operation two or three times a year. While the plants will, without suffering severely, stand periods of drought longer than any which have ever occurred in these islands, they reach their best development if watered by occasional periods of rain.

Our rainy season not only renders it certain that young plants newly set out will speedily and firmly establish themselves, but assures the production by old plants of large crops of long leaves; while the occurrence of a well-marked dry season renders it equally certain that these leaves will produce a good percentage of high-grade fibre.

Maguey is propagated either from suckers or from the small bulbs produced on the flower-stalk. It should be planted in the rainy season in rows $4\frac{1}{2}$ by 12 feet apart, or about 800 plants to the acre. The first crop of fibre can be harvested in three years from the time of setting out sucker plants. The average annual yield is twenty leaves per plant, or 16,000 leaves per acre. The yield of fibre is from 40 to 50 lb. of fibre per thousand leaves, or from 640 to 800 lb. per acre. The New York quotations for Maguey on 1st May, 1907, were, for No. 1, $7\frac{1}{8}$ cents per lb.; and for No. 2, $6\frac{7}{8}$ cents per lb. Maguey plants continue to produce leaves for a period ranging from seven to twenty years.

The cultivation of Maguey offers inducements to the small farmer and to the planter with large estates. This fibre is a staple commodity, the use of which promises to increase quite as rapidly as the production. The development of this industry during the past few years indicates that Maguey will become, at no distant date, one of the leading agricultural products of the Philippine Islands.

In 1899 a small plantation was formed of *Agave sisalana* at the Wollongbar Experiment Farm, and from time to time cuttings of leaves have been made and fibre extracted from same by means of the Faure Decorticating machine, originally imported for the purpose of making Ramie fibre.

According to a report by Mr. A. H. Haywood, Acting-Manager at the Wollongbar Farm, in December, 1907, these plants had reached the poling stage; that is, from the heart of the plant a pole or flowering stem had grown up, showing that the plants had about reached their term of usefulness.

Mr. Haywood states that in August, 1907, when cutting the leaves some ninety leaves were harvested from one plant, nine leaves being left on the plant uncut; the weight of the ninety leaves was 144 lb.;—an average leaf weighed $1\frac{1}{2}$ lb. It would appear therefore that the growth and weight of the leaf at Wollongbar does not materially differ from the weight in other countries, excepting that it may be somewhat heavier in the green state.

* Abaca-fibre made from the Manila hemp-plant.—*Musa textilis.*

Sisal Hemp Fibre.

One plant produced sixty-six leaves. Weight when green, 110 lb; yield, 4 lb. fibre. Grown at Wollongbar Experiment Farm, Richmond River.

Australian Imports.

As an indication of the value of the Philippine Islands trade with Australia in the matter of flax and hemp, the following figures are instructive. The importation from the Philippine Islands in--

		cwt.		£
1903	amounted to	24,680,	value	49,691
1904	,,	15,557	,,	32,016
1905	,,	26,077	,,	57,092
1906	,,	27,329	,,	63,073

The heaviest importations to Australia are from New Zealand and the Philippine Islands. The material from New Zealand for the most part being the flax fibre manufactured from the New Zealand flax plant *Phormium tenax*. The material from the Philippine Islands being the fibre obtained from the Aloe and from a banana-like plant, the *Musa textilis*.

There are certainly somewhat divergent opinions expressed by different authorities on the question of rich, medium, or poor soils being most suitable for the cultivation of the Sisal hemp plant. It may, however, be accepted as a fact that the Sisal hemp plant and other varieties of Agave will grow in places where the cultivation of ordinary agricultural crops would not be followed, whether owing to the stony nature of the country or its other unsuitable characteristics.

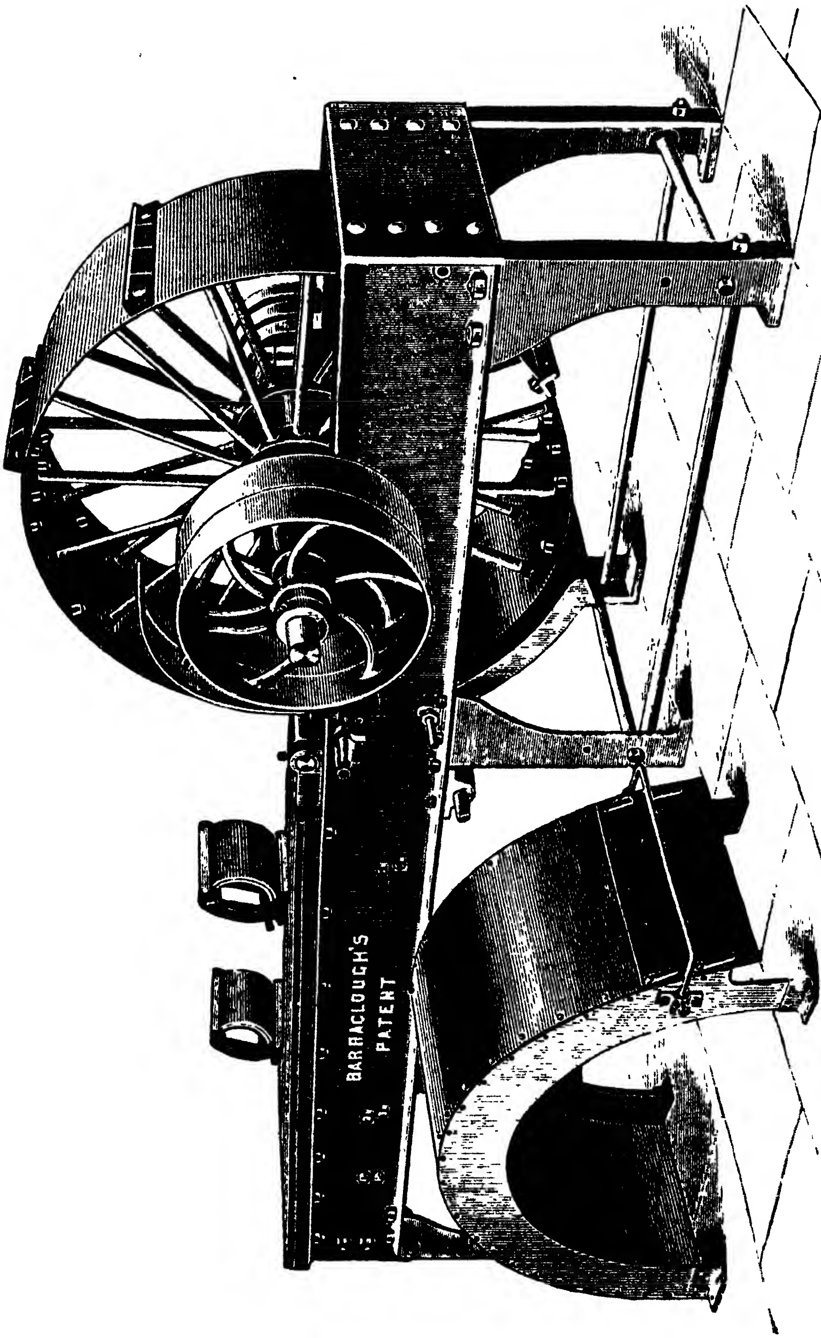
Mr. Cameron, Superintendent of Government Gardens, Bangalore, in a report made by him said:—

The advantage of the cultivation may be briefly stated as follows :—

1. Land of a gravelly and stony nature is suitable.
2. When land is planted up, the cultivation practically ceases for a period of four years, or until the matured leaves are ready for cutting.
3. On suitable land, failure of crop has never been heard of.
4. The profit on an acre of land yielding crop is estimated at £4 to £5 per annum ; that is, 60 to 75 rupees.

The large succulent growth obtained in rich land is inimical both to the quantity and quality of fibre produced ; therefore somewhat poor land of a loose stony nature is always preferred as, in addition to giving better results generally, it accommodates a

larger number of plants to the acre. Mysore possesses plenty of such land, and if the latter can produce leaves of 4 feet in length, it will do. But there is a reduction in value,



Barraclough's Patent Fibre-extracting Machine.

as well as difficulty in extracting the fibre, when the leaves are under 3 feet in length. In Yucatan, plants are put out in rows at 7, 8, 9, and even 12 feet apart, according to the nature of the soil. But the general practice is to allow nothing under 400 plants to the

acre, while 660 is considered about the maximum number. In the Bahamas the planting is somewhat closer. When a plantation is once established it may be profitably worked for a lifetime, care being taken not to let the plants pole or become exhausted from over-cutting. In a large plantation drives are left at convenient intervals to facilitate the easy removal of leaves.

Without doubt there are considerable tracts of scrub land in this State, especially bordering the coastal areas, whereon the cultivation of Sisal might prove to be a profitable means of utilising a class of country which is not otherwise likely to be put to any useful purpose. Private enterprises may do something under the stimulating influence of a bonus, but perhaps it might be possible for the Government to show the way.

Musa Textilis.—Manila Hemp.

Abaca fibre is obtained from a plant similar to the ordinary banana plant. In a report issued by officials of the Bureau of Insular Affairs, Washington, U.S A., respecting the production of Abaca in the Philippine Islands, the following particulars are given: –

The first stalks are ready for cutting at from twenty months to three years after planting. The time required for development varies considerably with different varieties and in different localities. After the first harvest it is customary to cut over a plantation about every eight months.

The abaca plant when mature consists of a group or cluster of from twelve to twenty stalks, all growing from the one root. These stalks are in all stages of development, but usually two or three will mature and can be cut at about the same time. The stalk is ready for cutting between the time of the appearance of the flower and the development of the fruit. If cut either before or after this period an inferior quality of fibre will be obtained. When the plant is in flower the large violet-coloured flowered bracts fall to the ground, making it an easy matter when passing through the field to select the plants which are ready for cutting.

The stalk is cut with a bolo knife having a sharp blade. The cutting should be made two or three inches from the ground and on a slant. If a perfectly horizontal cut is made, water will collect on the stump, causing it to rot, and thus injuring the root and the remaining shoots. After the stalk has been cut the leaves are trimmed off, and it is then ready for the first operation of fibre extraction.

Extraction of Fibre.

The extraction of fibre should commence within twenty-four hours after the cutting of the stalk. If left a longer time than this, the fibre is liable to become discoloured and weakened. As the abaca trunk is heavy and the fibre-extracting apparatus is light and easily transported, it is customary to move the latter from place to place, and to extract the fibre near the spot where the plant is cut.

The trunk or stalk of abaca is often 12 feet or 15 feet long, and from 1 foot to 1½ feet in diameter. This trunk consists of a small central fleshy stem, 1 inch or 2 inches in diameter, around which are a number of thick overlapping layers, each layer being the stem or petiole, of a leaf. The fibre is obtained from the outer portion of these leaf stems. The process of fibre extraction consists of two distinct operations; first, the removal of the ribbon-like strips of fibrous material from the leaf stems; and second, the separation of the individual fibres by pulling these ribbons under a knife.

The labourer, sitting on the ground with a trunk of abaca across his knees, inserts under the bark of one of the leaf stems a small sharp piece of bone called a "locnit," and pulls off a fibrous strip 1 inch to 3 inches wide, and as long as the trunk. One stem will yield two or three such strips. When these fibrous strips have been taken off the remaining fleshy material is removed, and each consecutive layer is thus worked down to the central stem of the trunk. The fibre obtained from the three or four outer layers, which are green and hard, will be coarse and dark-coloured, while that coming from the layers nearest the centre of the trunks will be very fine and white. The latter is not always stripped by the natives, as it is too liable to break under the knife, but, when extracted by this method, is used only for the manufacture of various kinds of cloth. When a quantity of these fibre strips has been collected, they are carried to some central point where a shed has been erected and an apparatus set up for stripping the fibre. The shed consists

of a frame of bamboo poles covered with abaca leaves. The stripping apparatus, or "panguijan," is simple both in construction and operation. It consists of a log set in a horizontal position 1 foot or 2 feet from the ground. On the top of this is fastened a block of smooth hard wood. Over this block is placed a bolo having a blade about 1 foot long and a handle 1½ feet long. A rattan is attached to the end of the knife and connected with a bamboo spring above. Another rattan passes from the handle to a foot treadle. The bamboo spring holds the knife down upon the block. Its pressure is easily regulated by lengthening or shortening the rattan. By means of the foot treadle the operator raises the knife when he desires to insert or remove a strip of fibre.

Stripping Knives.

In the process of stripping, the operator holds in his right hand one or more of the fibre ribbons and also a short round piece of wood. These strips are inserted under the knife, and are drawn through with a quick, steady pull. The ribbon is then removed and reversed, the cleaned end being wound three or four times around the stick. This process of drawing under the knife removes all the pulp or fleshy material, leaving in the hands of the operator a small bunch of clean wet fibre. As the fibre is stripped it is usually assorted into two classes. The work of fibre extraction, while apparently simple, is very exhausting, even for the experienced operator, and many labourers are ruptured by the excessive strain of pulling the fibre strips under the knife. It is a fair day's work to strip one arroba (25 lb.), and the fibre-stripper will usually work only two or three days a week.

All the fibre produced in the islands is extracted with this simple apparatus. The colour and strength of the fibre—two most important qualities—are determined almost entirely by the manner in which it is cleaned. The two factors in the process which affect the quality of the product are the condition of the knife-blade and the degree of pressure with which the knife is held upon the base block. With a serrated knife, loosely fastened, the fibres are only partially separated, and only a portion of the pulp is removed; the work is easy, the yield large, and the fibre is inferior in quality. With a knife having a smooth-edged blade and held firmly on the base block the work of extraction is much more difficult, and the waste is greater, but a very superior fibre may be obtained. It has been determined by experiment that the same plant will produce a very superior or a very inferior grade of fibre, depending on the kind of stripping-knife used. As a result of using serrated knives the markets have been flooded with enormous quantities of inferior fibre, and cordage manufacturers are continually making complaint about the quality of Manila hemp. The whole future of the industry depending, as it does, on the position which abaca continues to hold in the world's markets, it is manifestly to the interest of every producer to discourage the use of the serrated knife.

Fibre-extracting Machinery.

Numerous attempts have been made to extract abaca fibre with machinery. A number of the machines used have been in a measure successful, but some obstacle has always prevented their coming into any general use. The greatest difficulty has been that abaca, being a very long fibre, would not bear the strain of full tension while being cleaned. It has been necessary to wind the fibre around a cylinder, or to hold it in two or three places with a clutch, in order to lessen this tension. Cylinders of various kinds of material have been used, but all have resulted in a discoloration of the fibre. The machines thus far constructed have all been based on the old hand process of extracting the fibre by stripping. Inasmuch as sisal and other vegetable fibres are now successfully extracted by machinery, and as several American inventors are devoting their attention to the perfection of a machine for extracting abaca, it is possible that such a machine will come into use before many years. The fibre-extracting machine for abaca should be simple in construction, strong, cheap, and portable. It must not break, tangle, discolour, waste, or in any way injure the fibre. The introduction of suitable machinery will do more than any other one thing to advance the interests of the abaca industry.

After-treatment of Fibre.

Abaca, after being stripped, is hung on bamboo poles to dry. This drying takes from three to four hours to two days. When thoroughly dry, the fibre is collected, tied up in hanks or bundles, and in this condition is shipped by ponies, carabaos, or cargadores, to the nearest market. It is there sold to a Chinese middleman, or to the representative of some one of the large exporting firms of Manila. When the fibre reaches the warehouse of the exporter it is carefully sorted into the different commercial grades, and is then baled, each bale weighing 2 piculs, or 275 lb.

Fibre that is to be used locally for the manufacture of cloth undergoes much more elaborate process of treatment. The leaf stem in the centre of the stalk is selected, and the fibre is often drawn several times under the stripping knife, which gives a product that is fine, soft, and white. If to be used for the finest textures, it is then placed in a wooden bowl and beaten with a mallet until the required fineness and elasticity are obtained. This process yields a fibre that is almost silk-like; and some of the textiles manufactured from best quality abaca rivals in delicacy and beauty the celebrated pina and jusi fabrics.

Description and Yield of Fibre.

Abaca fibre of good quality is from 8 feet to 12 feet long, of a glossy white colour, very light and strong, and of a clean, even texture. As cordage material it has no superior, its chief value, particularly for ships' ropes, being its relative lightness and strength.

The yield of fibre varies greatly in accordance with the variety of the plant, the soil and climate conditions, and the methods of extraction used. Under favourable conditions the annual yield will average from 12 to 16 piculs of dry fibre per hectare, or 687·5 to 967·6 lb. per acre. The average yield throughout the islands is probably below this figure, often not exceeding 6 piculs per hectare. Under careful management the yield may be brought up to 20 or 25 piculs per hectare. From ⅛ lb. to 1 lb. of fibre is obtained from a single stalk. In Southern Mindanao the estimate is 212 stalks for 1 picul of fibre. With 1,250 plants to the hectare, and an annual yield of four stalks per plant, the returns for 1 hectare would be 23·6 piculs, or 3,245 lb. of fibre.

Twist of Grain in Timbers.

Dr. Robert Bell, Chief Geologist of the Geological Survey of Canada, writes to me as follows:

In Canada a large proportion of the forest trees have a more or less pronounced twist in the grain of the wood, which in, say, 90 per cent. is to the left—*i.e.*, if you look either up or down the trunk, the twist is in the opposite direction to the movement of the hands of a watch. It is supposed to be due to the prevailing winds. It has occurred to me that any theory as to the cause would be helped if one knew if a similar phenomenon occurs in Australia.

May I therefore ask how this is; to which direction the grain of the wood turns, and what you consider to be the cause. In what species of trees is it most marked.

The attention of readers of the *Gazette* is called to the matter, and correspondence is invited.

J. H. MAIDEN.

Cotton Growing in New South Wales.

W. R. FRY.*

FOR several years in many parts of the State small experimental crops of cotton have been successfully grown. The plant was first introduced into New South Wales by Governor Phillip in 1787, from seed obtained at Rio Janeiro when he visited there in H.M.S. "Sirius." At a later period a further supply was forwarded by Governor King to Norfolk Island, where it proved to grow well.

In 1899 the Department of Agriculture cultivated a few acres at Moonbi, near Tamworth (*Agricultural Gazette*, August, 1899), whilst at the Hawkesbury College and other experiment farms, it is grown annually for educational purposes.

The late Mr. John Mills was for years an enthusiastic grower in his suburban garden at Ashfield, and a successful prizetaker at the Royal Agricultural Show.

During the past four years the writer tested several varieties at the Moree Bore Farm, the product of which was exhibited at many shows, where it created much interest and inquiry. Many applications for specimens and seeds were received, principally from school teachers who desired to increase their pupils' interest in the school gardens. The plots were also inspected by many visitors, one of whom represented an American firm who contemplated establishing a cotton plantation and ginning mill in this State.

So far, however, no attempt at cotton growing as a commercial crop has been recorded in this State. Over the border in Queensland the industry has been resuscitated, and the area under cotton is being increased.

Various reasons may be advanced to show that cotton growing may eventually become one of our leading industries. Under the Rural Bounties Bill, recently passed by the Federal Parliament, a bounty of 10 per cent. on cotton lint, and another 10 per cent. on cotton seed is granted for a period of eight years, which is to apply to all the States. Owing to the consumption of cotton increasing at a greater rate than the production, the cotton mills in England have been forced into partial idleness. The chief demand is for a long staple high grade cotton, as the British machinery is reported to be not generally adapted to the short staple Indian cotton. Samples of cotton grown in this State and submitted to experts in England, have been reported of excellent quality, and in every case the staple was of useful length.

* Late Manager, Moree Experiment Farm.

Cotton seed which was at one time wasted, is now of increasing value owing to the oil extracted therefrom, and the cake manufactured from the residue.

The parts of the Commonwealth suitable for cotton growing are considerably greater than the area under cotton in the United States, being practically unlimited. The upland varieties of cotton from which the bulk of the world's supply is obtained, are no more difficult to cultivate than maize, although the harvesting is rather more expensive. It should also be distinctly understood that black labour is not essential for cotton growing. Everything in connec-

Cotton Bolls.

tion with the cultivation and manufacture of cotton can be, and is in many places, performed by white labour. To those farmers who might like to try a plot of cotton as an adjunct to other crops, the following notes on its cultivation may be of interest:—

Varieties.

Cotton belongs to the botanical order of plants called *Malvaceæ*, which includes the common weed marsh-mallow, the old-fashioned garden hollyhock,

the various hibiscus, and many other useful plants. The cotton of commerce is chiefly derived from the species *Gosypium herbaceum*, or green seeded cotton, and the *Gosypium nigrum*, or black seeded cotton, and the various crosses or hybrids between them. Several varieties were grown at Moree in rows 3 feet apart which distance proved too close on rich soil for successful horse cultivation. As the seeds were not received until November, the plot was irrigated to ensure a quick growth, an average germination of 85 per cent. being thus obtained.

The varieties were as follow: —

Varieties.	Estimated Acre-yield.	Notes on Growth.
	lb.	
Culpepper..	1,012	3 to 4 feet high; large dark leaves; shed a few pods.
Griffin	986	4 ft. 6 in. high, vigorous, spreading; light green crumpled leaf
Russell's Big Boll	1,420	4 to 5 feet high, upright; leaves large, dark, glossy; large bolls.
Jones's Re-improved	1,220	4 to 5 feet high, spreading, prolific; red stem first pod; ripe 27th February.
Tool's Early Improved	1,010	3 ft. 6 in. to 4 feet, similar to preceding; pods ripened March.
King's Early Improved..	880	3 feet to 3 ft. 6 in., rather dwarf, not so hardy as others; first pods ripe 14th February.
Lewis's Prize	1,498	4 to 5 feet, vigorous, spreading, and upright; most prolific.
Peterkin's	1,108	3 feet to 4 ft. 6 in., vigorous; shed young pods; black seeds; separated easily from lint.

The following season only two varieties were grown in plots, viz., the long staple Sea Island and the early Carolina prolific. The Carolina proved more prolific than the Sea Island, and ripened practically altogether, which is a most important quality for picking. It was originally believed that Sea Island cotton would not grow or bear successfully any distance away from the coast. At Moree, however, it produced lint which was pronounced to be of most superior quality, and although the yield was only about half that of other varieties, the price obtained would be about double. This variety has also been successfully grown in the Western inland districts of Queensland on a small scale, and as it is much more valuable than the upland type, should be grown wherever it has proved to do well.

The perennial tree cottons were also tried at Moree, but proved unsuccessful. The much advertised Caravonica variety grew to a height of 8 feet, but was cut back by frosts before bolls ripened. The plants were protected during the winter, but did not start growing until November, and only a few large bolls ripened before frosts in May. The alpaca and silk cottons were the same, but did not grow so high and appeared more delicate. These perennial tree cottons, or Caravonica varieties, are not profitable to grow in New South Wales on account of frost, although in Northern Australia they are most prolific. Of the varieties tested, the Lewis's Prize and Russell's Big Boll can be best recommended for this State.

Cultivation.

Cotton will grow in almost any soil, but is more productive, and therefore more profitable, in a deep sandy loam. The Moree soil was a stiff black clay,

which was not altogether favourable for the plant. It is distinctly a drought-resisting plant, and fairly revels in heat and sunshine. Possessing a deep tap-root it will grow in situations too hot for maize, and can sometimes be sown as a catch crop when the wheat fails for grain and is cut early for hay. It was noticed at Moree during the midsummer hot winds, when the leaves of maize, pumpkins, and even sorghum were curled up with the heat, that the dark green foliage of the cotton never wilted or turned a leaf. The ground is best prepared by deep ploughing in the winter and left rough to weather down; if it can be subsoiled cheaply, the tap-roots will have a better chance to get down.

The plot should be cross-ploughed in spring, and rolled and harrowed to bring it to a fine tilth. For upland varieties the furrows should be struck out similar in manner to that for maize, only 3 inches deep and 3 ft. 6 in. apart on poor soils, and from 4 to 5 feet apart on rich soil. The seed is sown in the furrow, three to five seeds every 15 inches to 20 inches apart, and covered lightly with not more than 2 inches of soil. If dropped by hand each " hill " can be tramped on to firm the soil around the seeds. Seed can be soaked before sowing if desired, but if land is moist will come up in four days. The best month for sowing is October, or as soon as danger of frosts is over. The plants should be allowed to grow until about 5 inches high, when they should be thinned out to two plants in each " hill," or single plants 15 inches apart. Where there are many " misses," due to attack of crickets, cut-worms, or old seed, the extra plants may be transplanted. If dibbled in firmly and watered they take as well as cabbages. One pound of good germinating seed is sufficient to sow an acre by hand, but more is required when drilled in by machine.

The after cultivation merely consists of frequent horse cultivation, similar to maize or other drilled crops.

The flowers generally appear in three months from sowing, and the pods ripen a few weeks later. First picking is generally in March, continuing through April to May. Excessive rain at this period is detrimental, as discoloured or soil-stained lint loses its lustre and is reduced in value. In some rainy seasons, many young pods, " bolls," or " squares," shed or drop off before reaching maturity, but as this trouble also occurs in dry seasons it is, probably, only a natural thinning of the crop. When the first crop sheds heavily or sets thinly, the second crop is generally more prolific.

A complete fertiliser is best for cotton containing a fair percentage of phosphoric acid, which can be distributed in the furrow with the seeds. In a course of rotation cotton does well after cowpeas which have been sown the preceding summer after hay.

Harvesting.

The crop is ready for picking when the bolls turn brown and burst open, emitting the soft dry cotton. It ripens unevenly, and picking should not commence until a fair number of bolls are open, and always after the dew

has evaporated. After it is all picked there is no further process for the grower in this State. It merely requires drying in the sun until the seed will crack brittle between the teeth, then bale the same as wool, and cart to the railway station, where it can be sold in its raw state. The actual picking is certainly rather tedious work, but it is not so back-aching as picking strawberries or green peas, of which acres are annually grown and picked by white labour. The writer at a first attempt picked 54 lb. of cotton in half a day (four hours), and with practice it should be easy to pick 150 lb. per day from a good crop. The usual rate paid for picking is ½d. per lb., and as children can pick as much as a man, the grower with the biggest family has the advantage during the picking season.

There is, however, every possibility of a cotton-picking machine soon becoming an accomplished fact, which will considerably increase the profits of cotton growing. According to the *Scientific American*, Mr. G. A. Lowry has constructed a machine which is reported to have stood a severe test in the field. The machine is provided with nicely balanced mechanical arms moving on a universal joint which is worked by pneumatic power similar to sheep-shearing machines, and even in its present state picks considerably more cotton than a number of hand pickers.

A machine that can exercise discrimination in picking ripe cotton bolls and not leaves, may seem rather too much to expect, but when we compare the apparently complicated reaper and binder or harvester with the methods of grain harvesting only a generation back, we may reasonably hope for similar improvements in cotton-picking machinery.

The average yield per acre of the upland types might be estimated at 10 cwt. of raw cotton, or lint and seed, which is worth about 2d. per lb. before ginning. There are no ginning mills in this State, the nearest being at Ipswich, in Queensland, or Messrs. Kitchen and Sons, Brisbane. This firm are also ready buyers of raw cotton delivered to any railway station, and also distribute seeds of approved varieties for next year's sowing. The seed can be obtained in small quantities from Sydney seedmen, whilst the Department of Agriculture distribute small quantities of different varieties to approved settlers, who will undertake to forward reports on the results. When picking, each variety should be kept separate and labelled, and future plantings should consist of the kind proved best for the locality. The plants are generally treated as annuals, but where seed is scarce, land plentiful, and frosts not too severe, the plants may be preserved for the next season. They are best pruned back to about 9 inches to 1 foot, and then covered or hilled up with the plough, until spring. When not required for next year the stock can be turned into the paddock to clear up twigs and stubble. As grown in this State cotton has not been subject to many parasitic fungous or insect pests. The ordinary cotton boll worm, which is a serious pest in America, is not plentiful here, but when it appears can be checked by dusting or spraying the plants with Paris green and lime.

At Moree the seed pods of a common weed closely related to cotton and identified as *Hibiscus arionum*, were found to be infected with some small caterpillars. These were forwarded to Mr. Froggatt, the Government Entomologist, who bred out the moth *Earias frondosana*, L., which damages cotton bolls in Egypt and Assam. In some cases this moth seemed to prefer the more juicy bolls on the cultivated cotton plots to its native food plant, especially when the latter were destroyed. Deep cultivation, frequent scarifying, judicious fertilising, and quick maturity are the chief essentials to be considered to successfully combat insect pests, and ensure abundant crops.

Settlers who are making money at any particular crop, are naturally loath to embark in an unknown industry. However, as there is an assured market for the raw material, and the expenditure for seed being so little (1 lb. seed per acre), there is practically no risk in growing a crop of cotton. The product is not perishable, and can be stored until satisfactory prices offer, if desired. The dairy farmer with a family, who has not yet adopted the milking machine, will probably find that he can profitably cultivate a few acres of cotton as a subsidiary aid, and the picking could be economically performed between milkings—without any additional outside labour.

Possessing an unlimited area of suitable soil and climate, and with improved methods of horse cultivation and picking machinery, we may reasonably expect Australia—from being at present the greatest wool-producing country of the world—to yet become famous for the production of that most important vegetable fibre—cotton; and thus provide employment for that increased white population which is so necessary for the development of the country.

Forage Crops on Black Soil at Moree Irrigation Farm.

A. E. DARVALL.

No. 1 Sorghum.

In the Western States of America the up-to-date cattle rancher not only cuts and stacks large quantities of the natural grasses and wild oats that grow in abundance in good seasons, but also sets aside a tract of level land—usually some 300 or 400 acres in extent—adjacent to the ranch house on which to grow fodder crops under irrigation for his stock. As it—the house—is always built near a river or strong spring, he usually has plenty of water for this purpose, but if not he conserves the rainfall by making a dam across the mouth of a neighbouring valley with a good watershed, by sinking wells and pumping constantly with windmills or oil engines into a reservoir, or, if he is lucky enough to be in an artesian belt, by putting down a bore; but water he must have, and usually manages to get in some way, if not he sells his ranch to a "tender-foot" and looks out for another where he can get as much as he requires. Having got water he grows lucerne, maize, oats, cowpeas, &c., stacking or turning them into ensilage in good years, and accumulating a store of food that will carry his stock over a series of bad ones and keep them in good condition in the autumn months when grass is scarce. In this country many squatters still trust to luck, and when a drought comes they either have to sell the majority of their stock for what they will fetch in an over-stocked market, or send them long distances by road or rail to fresh pastures that they have to rent at high prices, probably losing a good many head on the way, and not improving the condition of the rest. Now, with the money thus lost in one bad year, the squatter would probably find that he could fix up an irrigation scheme by one of the above methods that would last him a lifetime, and carry, at any rate, the majority of his stock through any drought.

To this end, it is hoped to carry out a series of experiments on this farm by which the best forage crops, and the cheapest method of growing them, may be ascertained.

The first trials were commenced in November last on land that had been cropped with millet in 1905, and oats 1906. It was ploughed with a disc plough to a depth of about 7 inches and cross-harrowed, bringing the soil to as fine a tilth as possible; it was then sown in three blocks with a Planters' Friend drill, the rows being 3 feet apart, No. 1 block with Saccharatum, No. 2 Planters' Friend, and No. 3 with Amber Cane. These were all sown on 13th and 14th November, and as on 2nd December they showed no signs of coming up, the land being fairly dry, they were given an irrigation, furrows being ploughed down every third row with an ordinary hand plough, which was run back in the same furrow in order to as far as

possible prevent the water from breaking out; the water was then allowed to run as slowly as possible down six furrows at a time, so as to soak but not flood the land; as soon as it was dry enough after the irrigation it was harrowed, and within ten days the crop was coming up well. After this it was cultivated after rains with a single cultivator, and was irrigated for the second and last time towards the end of January. On 24th February it was cut, having occupied the land for thirteen weeks. The stubble has, however, been left in, from which a second crop will be cut unless we have very early frosts. This second crop, although it will not be nearly as heavy as the first, will cost practically nothing, and will, therefore, reduce the average expenses of the whole. The following are the results:—

Block I.—*Sorghum Saccharatum.*

Seed sown, 5½ lb.
Area sown, 8·58 square chains.
Total yield, 8 tons 1 cwt. 3 qrs. 16 lb.
Cost per ton to grow, 7s. 3d., estimated as follows:—

	Man at 7s. per day	Horses at 4s per day.	Number of Hours.	Rate per Hour.	Cost.
				s. d.	£ s. d.
Ploughing	1	3	5¼	2 4½	0 12 5
Harrowing	1	3	2¼	2 4½	0 5 4
Sowing	1	2	3½	1 10½	0 6 6
Harrowing	1	2	1½	1 10½	0 2 9
Single cultivating	1	1	8	1 4½	0 11 6
Ploughing irrigation furrows ...	1	2	3½	1 10½	0 6 6
Irrigating	1	...	16	0 10½	0 14 0
			Total cost ...		£2 19 0

Block II.—*Planters' Friend.*

Owing to bad seed this was an absolute failure, and the land was replanted with maize.

Block III.—*Amber Cane.*

Seed sown, 7½ lb.
Area sown, 15·54 square chains.
Total yield, 8 tons 9 cwt. 3 qrs. 6 lb.
Cost per ton to grow, 11s. 6d., estimated as follows:—

	Man at 7s. per day	Horses at 4s. per day.	Number of Hours.	Rate per Hour.	Cost.
				s. d.	£ s. d.
Ploughing	1	3	8¾	2 4½	1 0 5
Harrowing	1	3	3¾	2 4½	0 8 10
Sowing	1	2	5⅚	1 10½	0 10 10
Harrowing	1	2	2½	1 10½	0 4 7
Single cultivating	1	1	14⅙	1 4½	0 19 2
Ploughing irrigation furrows ...	1	2	5⅚	1 10½	0 10 10
Irrigating	1	...	26⅔	0 10½	1 3 4
			Total cost ...		£4 18 0

This does not include cost of seed, water, cutting, &c., &c.

Notes from the Botanical Laboratory.
HAWKESBURY AGRICULTURAL COLLEGE.

Rhodes Grass Seed (*Chloris gayana*, Var.)

C. T. MUSSON.

A SAMPLE of the above seed having been submitted for examination by Mr. Sylvester Browne, the results are thought to be worth recording, seeing that we have no published details with regard to its value in seeds present and their vitality.

Character and proportion of actual seed to chaff.

The flowers are small and come away from the supporting stalk in two's or three's. If two, then only one good seed is usually formed. If three, there may be two seeds, but one of them will be small. The seeds are remarkably small for the size of the grass. They are spindle-shaped and reddish brown, weak seeds being short and whitish. In size and number, per lb., they come near the Poa grasses. The numbers given have been carefully worked over, but when dealing with such light and numerous seeds the results can only be considered as approximations; still they may be taken as sufficiently correct for all practical purposes.

Pounds to the bushel	8*
Flowers in the pound	2,940,000
(Of these half may be expected to produce seed.)	
Actual seeds found in 1 lb. of "seed" ...	583,000
Percentage of actual seeds to total number of flowers, about	20

Germination capacity (vitality).

Percentage of actual seeds that germinated, *i.e.*, of the 583,000 seeds present in each pound of seed there germinated in each 100 ...	69
Percentage germinated seeds out of the total number of flowers, about	14
Total number of plants obtainable from 1 lb. of this seed, about	402,000

The seeds come away very easily from the chaff and are readily examined and counted with the help of a pocket lens.

Quantity required for sowing.

In consequence of its having come so recently into cultivation, there is no guide in the use of this particular species as to quantity required for sowing. It is not an uncommon thing to use 40 lb. of mixed grass seed per acre. This, however, would allow for "top" and "bottom" grasses,

* This light "seed" is very difficult to pack in the measure, consequently different observers will usually obtain different results.

for "short-lived" and "long-lived" forms, looking in general to a pasture to last from five to ten years, and allowing for weak germinating capacity.

Rhodes is such a strong bulky grass when well grown that there would seem little necessity to sow heavily; more particularly so, seeing its capacity for "running" and rooting at the nodes (joints).

The main difficulty in using a small quantity would lie in the cohesive property that pertains to the bulk sample. Experiments might be tried in the matter of mixing it with sharp dry sand, or some old small seed, such as white clover or couch. Seeds used for such admixture should, however, have the germ killed by baking or otherwise, and should be thoroughly and carefully mixed with the Rhodes before sowing.

Ten lb. of this seed per acre would provide ninety plants per square foot. Half the quantity would do, provided a fairly even distribution could be obtained. This should be ample. In the long run, probably only half a dozen would live on that area, those getting the best start providing all the successful plants; those coming on later would be smothered out by the earlier ones overshadowing them. Still it is necessary to put in much more seed than is actually wanted.

Summary.

There are no records to which we can refer in order to judge this seed. It can be taken as an average sample, and we may take it that the main difficulty in planting would be in relation to its even distribution. If this difficulty can be overcome, 5 lb. per acre of seed showing vitality anywhere near this sample would be sufficient. It would be well worth while having a seed-bed, and transplanting; but the labour of planting an acre would be considerable, whilst for large areas would be almost out of the question.

TAGOSASTE OR TREE LUCERNE (*Cytisus proliferus*).

J. H. MAIDEN.

I DREW the attention of Dr. George V. Perez, of Teneriffe, a prominent introducer of this fodder-plant, to the fact that New South Wales grazing animals were not very partial to it. I sent him some reports—amongst others that contained in the *Gazette*, vol. X, p. 38.

He recommends that the merits of this plant be still further pushed, and insists that farmers will realise its value if persevered with. He adds: "Experimental plots, say 10 yards square, should be made. Mixed with chaff-straw it makes excellent food; but the farmers have to be shown, otherwise it will never be taken up."

When recently in Tasmania I noticed that it was used in more than one garden for a hedge-plant, and it looked very fresh and bright. It stands the shears well.

COMMONWEALTH OF AUSTRALIA.

Bounties on Australian Products.

THE Commonwealth Government have issued a Memorandum for the information of growers and producers, respecting Bounties on Australian Products, under the Bounties' Act of 1907, which is now in force, and provides for the payment of a total sum of £339,000, spread over a term of years.

The following Schedule shows the goods upon which bounty is payable, the number of years during which payment will be made, and the rates of bounty :—

FIRST SCHEDULE.

First Column.	Second Column.	Third Column	Fourth Column.
Goods on production of which Bounties are granted.	Period dating from 1st July, 1907, during or in respect of which Bounty may be paid.	Rates of Bounty.	Maximum amounts which may be paid in any one year.
			£
Cotton, ginned	8 years	10 % on market value	6,000
Fibres—New Zealand flax ...	10 years	10 % on market value	3,000
Flax and hemp	5 years	10 % on market value	8,000
Jute	5 years	20 % on market value	9,000
Sisal hemp	10 years	10 % on market value	3,000
Oil materials supplied to an oil factory for the manufacture of oil—Cotton seed.	8 years	10 % on market value	1,000
Linseed (flax seed)	5 years	10 % on market value	5,000
Rice, uncleaned	5 years	20s. per ton	1,000
Rubber	15 years	10 % on market value	2,000
Coffee, raw, as prescribed ...	8 years	1d. per lb.	1,500
Tobacco leaf for the manufacture of cigars, high grade, of a quality to be prescribed.	5 years	2d. per lb.	4,000
Fish—Preserved as prescribed	5 years	½d. per lb.	10,000
Fruits—Dates (dried)... ...	15 years	1d. per lb.	1,000
Dried (except currants and raisins) or candied, and exported.	5 years	10% on market value	6,000
Combed wool or tops, exported.	3 years, commencing from 1st January, 1909.	1½ per lb.	10,000
	1 year, commencing from 1st January, 1912.	1d. per lb.	
	1 year, commencing from 1st January, 1913.	1d. per lb.	

White labour only shall be employed in the production of goods, upon which bounty is claimed, the only exception being in favour of Aboriginal natives; or any coloured person born in Australia, and having one white parent.

The wages paid in the production of bountiable articles must be the standard wages payable in the place or district.

Notice of intention to claim bounty on goods is required to be forwarded to the State Collector of Customs, or to the Officer-in-charge of the nearest Customs Office.

With regard to any soil products, notice of intention to claim bounty should be sent to the Collector of Customs, not later than 60 days after planting. In the event of the crops having been planted before the commencement of the Act, the notice of intention to claim should be sent to the Collector before 10th June, 1908.

As to manufactures, notice of intention to claim bounty should be sent to the Collector of Customs at least 90 days before bounty is claimed.

In order to obtain bounty the grower or producer must have produced not less than the quantities specified below, within one financial year, that is, between the 1st July in any one year, and the 30th June in the next succeeding year:—

Goods.	Minimum Quantity.
Cotton, ginned...	250 lb.
Fibres—	
New Zealand flax ...	5 tons.
Flax and hemp	5 cwt.
Jute ...	10 cwt.
Sisal hemp ...	1 ton.
Oil Materials—	
Cotton seed	5 cwt.
Linseed	5 cwt.
Rice, uncleaned	1 ton.
Rubber ...	2 cwt.
Coffee, raw	250 lb. of coffee beans.
Tobacco Leaf ...	5 cwt.
Fish, preserved	5 tons.
Dates ...	10 cwt.
Dried Fruits ...	5 cwt.
Combed Wool Tops	1 ton.

All goods must be merchantable, and the quality prescribed, with regard to tobacco leaf, is determined by its selling value. No bounty will be paid on tobacco leaf unless there is satisfactory proof of sales to a *bonâ-fide* producer, at a price of not less than 1s. per pound.

The forms of notice of intention to claim bounty, and all other forms required by the regulations, copies of regulations, and all information on the subject, may be obtained on application at any Customs Office.

Notes on the Milling Nature of the 1907-1908 Harvest in New South Wales.

F. B. GUTHRIE AND G. W. NORRIS.

THE recent harvest, which appeared at one time likely to be endangered by the dry conditions prevailing over most of the State during the winter months, has, on the whole, exceeded expectations. While there is probably no great surplus for exportation, the average yield has been fair, and, owing to the good prices obtainable, satisfactory to the grower from a monetary point of view.

A glance at the figures supplied by the State Meteorologist shows that the rainfall for the year 1907 was below the average in most of the wheat-growing districts, the northern portion of the State suffering the least from the dry weather. The rain that fell in the southern and south-western districts was, for the most part, in March and November, the latter fall having saved the harvest in many cases. The Riverina suffered most from the dry conditions, the rainfall being below the average in every month. The winter months were particularly dry, and the dry conditions continued right through September and October. Light to moderate rains became general early in November, but did not reach the Southern and South-eastern Divisions until the middle of the month, when fairly good rains were general. This was followed by hot and dry weather till harvest-time.

The results of the milling tests of typical wheats from the principal wheat-growing divisions is instructive in showing how the season has influenced the character of the grain, and particularly the gluten-content of the flour.

Speaking generally, the gluten-content is much higher than usual, and this is particularly the case with the southern wheats, including those from the Riverina, where the rainfall was below the average for the year and below the average in nearly every month. The November rainfall was followed by hot weather, and the previous hot and dry conditions were all favourable to the production of a grain rich in gluten, which is always increased when the ripening of the grain takes place rapidly.

Rapid ripening takes place when air and soil are hot and dry and the nights warm. The opposite conditions—moist and cool air and soil—promote the formation of plump, soft, starchy grain, yielding a less glutenous and generally a weaker flour. Consequently, the conditions that tend to diminish the yield are those that are productive of a grain of better quality.

It will be seen that the southern wheats give a stronger and more glutenous flour than the others. The F.A.Q. sample is a remarkably good one; indeed, there is to be noted a general and marked improvement in the quality of the grain produced locally during the last few years, particularly in the matter of flour-strength.

The samples milled were obtained through the courtesy of Messrs. Gillespie Brothers, who kindly supplied us with representative samples from the southern, south-western, and western districts. The F.A.Q. sample was the sample fixed by the Sydney Chamber of Commerce, and we are indebted for it to Mr. H. C. Mitchell, the secretary of the Chamber. The northern sample was obtained through the kindness of Messrs. Lindley, Walker, & Co.

NOTES on the Milling Nature of the 1907–1908 Harvest in New South Wales.

Variety of Grain.	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Mill Products.			Colour of Flour.	Strength of Flour.	Percentage of dry Gluten.	Notes.
				Flour.	Pollard.	Bran.				
F.A.Q. Standard, 1908 ..	Dull white, soft, plump, medium size.	lb. 62½	Easy to mill	68·2	15·2	16·6	Excellent.. ..	51·6	10·64	Bran, fairly clean, medium size; pollard, fairly clean; break-flour, 16 per cent.; semolina, white and soft; character of wet gluten, slight yellow tinge, elastic, coherent; dough, light cream colour, soft, coherent.
A representative sample from Southern Districts.	Dull white, plump, soft, medium size.	63¼	Easy to mill	69·5	16·1	14·4	Excellent yellow tinge.	49·6	12·48	Bran, clean and large; pollard, fairly clean; break-flour, 13·5 per cent.; semolina, white and soft, character of wet gluten, yellow, elastic, very coherent; dough, yellow, elastic, coherent.
A representative sample from South-west Districts.	White, plump, soft, medium size.	62	Easy to mill	69·6	15 8	14·6	Excellent.. ..	47·4	11·81	Bran, fairly clean, medium size; pollard, fairly clean; break-flour, 16·6 per cent.; semolina, white and soft; character of wet gluten, yellowish, elastic, very coherent; dough, yellowish, coherent, elastic.
A representative sample from Western Districts.	Semi-translucent, plump, medium size, soft.	63¼	Easy to mill	70·2	14·7	15·1	Excellent.. ..	47·2	10·0	Bran, fairly clean, medium size; pollard, fairly clean; break-flour, 15 per cent.; semolina, white and soft; character of wet gluten, slight yellow, slightly elastic, very coherent; dough, light cream colour, soft, coherent.
A representative sample from Northern Districts.	Dull white, plump, soft, medium size.	62¼	Easy to mill	70·0	17·3	12·7	Excellent slight white tinge.	49·4	10·04	Bran, large clean; pollard, clean; break-flour, 13·9 per cent.; semolina, white and soft; character of wet gluten, slight yellow, elastic, coherent; dough, faint, yellow, elastic, coherent.

Diseases of Fowls.

[Continued from page 222.]

G. BRADSHAW.

CHAPTER VIII.

Rheumatic Troubles.

THIS general description includes the several forms of limb trouble to which fowls are subject, because at first sight they are not easily distinguishable from one another, but, as a rule, the treatment is the same. The different ailments are rheumatism, leg-weakness, and cramp.

Rheumatism may be said to arise from blood impurities, which, if not removed, form deposits in the limbs, and these deposits constitute what is know as gout. Poultry which are reared in confined places, where the amount of exercise is limited, or where kept in damp places, or roost in damp houses, are most likely to suffer from the complaint. The treatment which is effective for rheumatism and gout consists in giving some saline aperient, such as Epsom salts, to clear the system, using a little stimulating liniment, in order to revive the muscular action, and dissipate any deposit that may have a tendency to form.

The legs should be first well bathed with warm water, and then rubbed briskly with a mixture of turpentine and salad oil. The fowls should have good and nutritious feeding during the time of treatment.

Leg-weakness is of several kinds, and before dealing with the usual forms of it, it may be well to mention that sometimes young hens lose the power of their legs after laying, and this must be carefully distinguished from the ordinary leg-weakness, and usually occurs more suddenly.

A young hen may have laid, or want to lay, and she may quite unexpectedly lose all power from her legs, and remain squatted down, unable to move. This indicates muscular trouble in the egg organs, to overstraining in laying a double-yolked egg, inflammation, or other causes.

Leg-weakness proper affects young poultry for the most part, and is due to constitutional weakness, improper feeding, &c., and appears in cockerels more often than in pullets, and usually in those of between 3 and 5 months of age. It is particularly prevalent with the heavier breeds, and those of the long-legged varieties which require a considerable amount of bone in their long limbs to support the weight of their bodies. The bird is more or less incapable of holding itself up, and frequently sinks to the ground, and often is unable to stand. The weakness is frequently due to a forcing diet. To obtain this bone-forming substance it is necessary that the birds should be specially fed on suitable nourishing foods—barley, ground raw bones, and meat, with plenty of fresh green food.

The best treatment is to administer pills composed of phosphate of lime, 5 grains; sulphate of iron, 1 grain; sulphate of quinine, ½ grain; strychnine,

$\frac{1}{16}$ of a grain. The above quantity will make a dozen pills, one of which should be given each day. The fowls should be kept in a dry place, and allowed to rest on soft hay or straw.

Cramp, another form of leg-weakness, due to defective circulation, and brought about in the same way as rheumatism—by damp, and want of exercise. It is not a difficult matter to distinguish cramp from leg-weakness, because, in cases of cramp, the toes are usually affected, being turned in; and not only so, but frequently a number of the chickens or ducklings will go wrong because the same cause affects more than one. On the other hand, in the case of leg-weakness, as a rule, a single bird here and there goes wrong. It ought not, therefore, to be difficult to distinguish between cramp and leg-weakness. The remedy for cramp is to use a stimulating liniment, and to keep the affected bird in some place where it will be warm and dry until it recovers.

An American writer says leg-weakness is caused by pushing for growth, by feeding too much for growth, thereby increasing the weight of the body beyond the ability of the legs to support it.

If the birds are getting into condition they move slowly, and the limbs slightly shake. In a week's time they can scarcely keep on their legs, and when feeding will sit down so that the body nearly touches the ground. The bird otherwise appears to be healthy; the feathers bright, the eye clear, and the appetite is good. As the days pass he loses his desire for food, and becomes thin. All causes of trouble should be removed. Spice, corn and corn-meal, buckwheat, and rye should not be given to such birds. A grass run, with shade and cool water, will help to cure, while one-tenth of a grain of quinine given to each bird with leg-weakness will generally bring it to health again.

Professor Woodroffe Hill says:—"Leg-weakness is occasionally constitutional, and in such cases is manifested in very young chickens. It has also been observed in the latter when they have been kept on boarded floors for any length of time." *Treatment.*—A careful attention to the diet should be observed; the food should be nutritious, without being stimulating or fattening. If the bird treated has been forced, and is heavy in body, it is better to reduce the weight by allowing less food and the administration of an aperient. Salts of iron and phosphate of lime are useful medicinally, also bone-meal. Friction to the legs, using a mild liniment, is sometimes serviceable in promoting circulation, which becomes retarded, and relieving cramp, owing to the want of exercise and continued flexed position of the limbs.

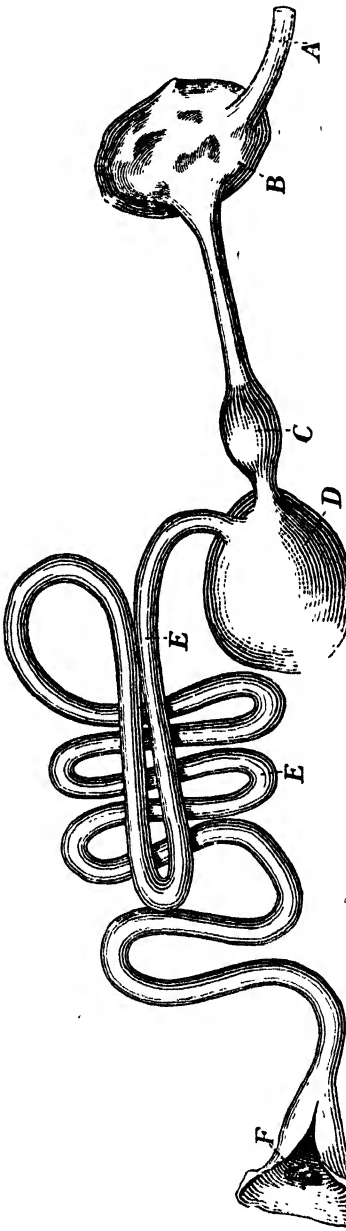
Frank Townend Barton, First-class Honorman, Royal College of Veterinary Surgeons, London, says:—"Leg-weakness is essentially a disease of youth, and caused by any condition which interferes with the proper development of the bird, such as improper food, defective supply of bone-forming materials, or bad surroundings." *Treatment.*—Careful attention to the food; allow a free supply of lime and green food. The following pills will be found useful:—Carbonate of iron, 48 grains; chloride of calcium, 24 grains; phosphorus, $\frac{1}{2}$ grain; extract of Indian hemp, 3 grains; strychnine, $\frac{1}{4}$ grain. Mix thoroughly and make 48 pills. Give one twice daily after feeding.

CHAPTER IX.

Crop Troubles.

THERE are several diseases of fowl's crops, the majority of the cases being brought about by careless feeding, while sometimes it is due to the birds themselves.

The fowl's crop is found at the bottom of the gullet, and from various causes the food may become stopped there, just as it had been swallowed. In the course of the fowls' wanderings they swallow a very wide collection of materials—seeds, weeds, insects, worms, grubs, pebbles, &c., and if long, coarse grass is had access to, some of this may form into a ball and obstruct the passage, with the result that the bird gets no nutriment at all, becomes hungry, eats more, all of which lodges in the crop until it assumes an enormous size, and, when noticed, the fowl, through starvation, has become shockingly thin of flesh, and, to save its life, treatment is necessary. Yarded fowls, if they have been receiving no green food, and are then supplied with large quantities of it, sometimes eat to repletion, and the crop, being unable to perform the first and necessary assimilation or softening process, the food forms into a ball, and being unable to press down through the passage, is a cause of hard crop.



The Alimentary Canal of the Domestic Fowl. (*After E. Evans.*)
The alimentary canal has been taken out, and the small intestine coiled round so as to take up less room. A. upper œsophagus; B crop; C. stomach; D. gizzard; E. small intestine; F. opening of rectum in cloaca.

Feeding new soft wheat or maize is often responsible for another sort of crop trouble The grain swells, the crop becomes a hard mass, treatment again being necessary. Occasionally a piece of broad grass has been swallowed; this, getting across the passage, bars the food from its legitimate course, and causes swollen crop. Often a piece of string gets into the bran or pollard, and may cause the obstruction; or other things may be responsible.

Frequently a fowl may have swollen or enlarged crop for some time before

the owner is aware of it, and at times the bird pines away and dies before the cause is known, for, apart from mopishness and a listless appearance, there is nothing to denote the illness except the bird is caught and the crop examined. Sometimes a bird may be caught, and, through having eaten a big feed, may appear to be crop-bound when such is not so; and, to make sure, in all cases t e bird should be confined for a dozen hours in some place where there is no food, and, if crop-bound, the enlargement will still be there, but if the crop has become empty the fowl may be placed back in its run.

Should the contents of the enlarged crop be maize or other grain, the simplest remedy is to pour, say, half a tea-cup of moderately hot water down the fowl's throat, knead thoroughly on the outside with the fingers, when the mass will become broken; then take the fowl by the legs, also holding the wings, allowing her head and neck to hang down at full length, with a downward working and pressure of the fingers of the right hand, and placing the forefinger of such in the bird's mouth to keep it open; the grain and water will readily empty out. Several emptyings will be necessary, for the bird can be held in the position but a short time, otherwise it will choke. After each emptying, more water will have to be administered, and the last should contain a teaspoonful of sweet or salad oil, and be allowed to remain in the crop, when there will possibly be no more trouble. The bird should be removed to a pen by itself, and in an hour or two receive a small feed of bread and milk.

There are times when the removal of food in the above way does not remove the obstruction, and should the crop again become distended, an operation will be necessary. The following on this subject was lately contributed to an English paper:—

The Treatment of a Crop-bound Fowl.

Irregular feeding or over-feeding fowls with hard, dry grain is very liable to cause crop trouble. Over-distension by giving too large a quantity of grain after a long fast, or mechanical obstruction on account of some indigestible substance (long rank grass, for instance) blocking the passage from the crop to the gizzard, is a common cause. Where no regard is paid to the hours of feeding, and large quantities of grain, such as Indian corn and poor oats and barley, are thrown down, some fowls will be sure to gorge themselves greedily with it. As soon as the grain is put within reach they rush eagerly at it and eat all they can, a mouthful at a time. That is unnatural; a fowl should pick up a grain, and not a mouthful at once. The bird, stimulated by the presence of the others, swallows as much as possible, overfills its crop, and then has what in the human being would be called "a pain in the chest." By instinct, the bird has recourse to water to remedy it, but food can only pass to the gizzard as that organ empties itself of the stuff previously in it. In the meantime the food swells, and causes distension of the crop. From the frequent occurrence of this, there is a loss of digestive powers; the crop has become large, weak, and flaccid, unable to dispose of the food daily put in it. Appetite ceases and thirst increases, the fowl drinks to the last, and dies. If the crop is merely swollen, a good remedy is to pour a tablespoonful of neat gin or brandy, or strong salt water, down the bird's throat, and starve it for a day—*i.e*, from one breakfast-time until the next—and then feed it sparingly with soft food three times a day, mixing some finely-chopped raw onion in it. If this plan fail to effect a cure, operation is necessary. The crop may be opened easily in the following manner:—Pick off the feathers down the front of the breast in a straight line, and about ½-inch wide, then with a lance or a sharp knife cut it open, the incision being 1½ inch long, and made over the most dependent part of the crop. Next make a small incision in the crop, introduce the finger and withdraw all the contents and well wash it. Then, if necessary (that is, if the crop has become so loose that it appears to have broken through the outer skin), with a pair of sharp scissors cut a piece out of the crop, including the incised part, from ¾-inch to 2 inches wide in the

centre. A piece 2 inches wide will, in most instances, be sufficiently large, but such cutting is only to be recommended when a fowl has a very much-distended crop. When the crop is open it is best to pass a finger (greased) into the passage to feel the outlet, in case of there being some obstruction; also to put into the crop a small piece of lard. Close the opening in the crop by sewing it, and when that is done rub the stitches with plain healing ointment, then sew up the outer skin. This is the part of the operation that requires the most care. The crop is quite distinct from the outer skin, and if the operator is nervous, or the fowl fidgety, it sometimes happens that the two are sewn up together. It is a fatal mistake. The outer suture should be sewn closely, and then rubbed with pure grease or ointment, so that every opening is filled. Let each stitch be independent of the other by knotting the ends, and be careful that the lips of the wound are drawn closely together. About four stitches in the crop and three in the outer skin will be sufficient. Horsehair or fine catgut, rubbed with glycerine, may be used. After the operation the bird should be put in a quiet and dark place, and fed only on gruel for a few days, allowing a few hours' rest before food is given. If the patient goes on well, a cure will generally be effected in ten days, or, at most, a fortnight. Let your flock of fowls be constantly supplied with sharp flint grit, feed them at regular intervals, and see that they have clean drinking water. A pinch or two of table salt occasionally mixed with the meat is very beneficial, as it helps to aid assimilation and prevents sour crop.

The other troubles are soft crop, and inflammation of the crop. Mr. E. Brown, an English authority on poultry diseases, says:—

It is not easy to exactly determine the causes of soft crop, but in many cases it is due undoubtedly to very acute indigestion; sometimes it is owing to water or air in the crop. I have upon several occasions known soft crop to occur after a case of crop bound. If the crop is felt it will be found to be soft, resembling a half-filled balloon. The disease can sometimes be cured by holding the bird upside down and squeezing the crop between the hands, which expels the air or water, as the case may be. If this is ineffectual, it is necessary to make an incision with a sharp knife or needle. The greatest care must be exercised in the feeding, and little or no drinking water should be supplied. It is advisable to keep the bird by itself, where it can procure no food, as carelessness in feeding may have very serious consequences. The bird should never be allowed to eat to repletion. If any drinking water is supplied it should only be given after each meal, and to it a few drops of nitric acid should be added.

Inflammation of the Crop.

A bad case of inflammation nearly always ends fatally, and it is only during the early stages that a cure is at all likely to prove successful. The cause of this complaint is the presence of an irritant poison, and the symptoms are difficult breathing, a mopish and dull appearance, and constant vomiting. Mr. W. Hill, an authority on the diseases which affect poultry, recommends the following treatment:—Mucilaginous or albuminous fluids, such as barley-water, milk, and isinglass, or a thin solution of gum, should be freely administered after first evacuating the crop. Should phosphorus have been taken, magnesia may be given, followed by turpentine mixed in cream. Oil must not be administered. Lead is often a cause of poultry-poisoning when paints are about. In this case the crop should be immediately evacuated, and half a teaspoonful of sulphate of magnesia and 5 minims of sulphuric acid, mixed in a wineglassful of water, be administered without delay. In a couple of hours 5 grains of iodide of potassium may be given in a teaspoonful of water. Afterwards feed on mucilaginous liquids. If purging commences, give a teaspoonful of castor-oil, with a grain of opium. Crude or unslaked lime is an irritant poison to fowls, producing inflammation of the throat, crop, gullet, gizzard, and intestines. In this case oil should be at once administered, followed by full and frequent doses of mucilaginous or albuminous fluids.

(*To be continued.*)

Progress Report from Mr. W. W. Froggatt.

[Mr. Froggatt is travelling on behalf of the Governments of Queensland, New South Wales, Victoria, and South Australia, in quest of means of combating the fruit-fly and codling moth pests, and other fruit and plant diseases.]

Sir,

My last report, written in Habana, dealt with my investigations in Mexico. Since then I have been through the West Indies, and am writing this at sea, on my road to London, which we are timed to reach on 10th February. There I propose to see as many of the economic entomologists as I can, and all the collections of economic work, at the same time finding out all I can about the quickest methods of seeing the economic entomologists of Southern Europe interested in fruit-flies and other pests, and the route through the Mediterranean.

I left Vera Cruz, Mexico, on 28th November of last year, and coming round by Progresso, on the coast of Yucatan, where we spent a day loading bales of sisal fibre, the chief product of this State, reached Havana on the 2nd December.

As soon as I landed I engaged an interpreter, and after calling upon the British Consul, presented my credentials to the Minister of Agriculture, who gave me letters to the scientific societies and the Director of the Experiment Station at Santiago des Vegas, to which place (14 miles out of town) I went next day.

The Director, Mr. I. F. Crawley, and his staff (all Americans) did everything they could to make my stay profitable, and I spent a good deal of time at this station. The greater part of this district is red soil over limestone formation, and one of the most profitable industries is growing wrapper-leaf tobacco. Nearly all the small holders grow some tobacco, sometimes shaded with banana plants, but more often without. This is all cultivated and watered by hand. There are, however, a number of large growers, who cover the plants with cheese-cloth, which protects them from insect pests, breaks the direct rays of the sun, and keeps the soil moist; so that the plants grows more rapidly, and with perfectly shaped leaves. One firm have 30 acres sheltered with cheese-cloth on poles and wire about 9 feet in height. The filling tobacco is grown in the ordinary manner. The chief pests of the tobacco planter are the larvæ of the large hawk moths (probably several species) and cut-worms. The men employed on the tobacco estates are constantly going over the plants and hand-picking the grubs, for even a small hole spoils a wrapper leaf.

A number of citrus orchards have been started these last few years by American growers, and consist of grape-fruit (pomelos), oranges, mandarins, and a few lemons; but three-quarters of the trees grown are grape-fruit, which is the fashionable fruit in the United States, and is

now being shipped to England. It is extensively grown in Florida, Cuba, Porto Rico, and Jamaica, and is eaten as a breakfast fruit, with sugar. There is a semi-wild species common in the peasants' gardens, which has a smooth skin, with a very fine flavour; but is smaller than the cultivated ones. Grape-fruit usually brings 4 dollars (16s. 8d.) a case in the New York market. All the citrus fruit in Cuba is badly discoloured with melanose, or rust-mite, and many of the fruits look as if they had been dipped into ink, they are so black; others are rusty red. Several lecanium scales are very abundant, and blacken the trees with smut. One very large lecanid scale, which I saw here for the first time, attacks the bark somewhat like "woolly aphis," and damages the bark where it is cracked or broken. "White louse" is another common pest; but there is no "red" or "yellow scale" in these orchards. The annual rainfall of Cuba is 60 inches; but this last year has been a drought all over the island, and they have only had about half their usual rainfall; so that the orchards look at their worst. I found no record of fruit-flies in the orchards; but one peculiar pest is a bright greenish weevil (*Pachnaeus eurescens*), which in the larval state feed upon the outer surface of the roots of the citrus trees, where they pupate. When they emerge they climb up into the foliage, where the beetles lay their eggs between the leaves, which they gum together in exactly the same way that the "apple-root weevil" (*Leptops hopei*) does in the Victorian orchards.

Where the leaf-cutting ants (*Atta insularis*) are numerous, they do an immense amount of damage, stripping every leaf off a tree in a single night; and roses and vegetable gardens suffer as much as orchards.

In the experimental plots I noticed for the first time a native chrysomelid beetle attacking the foliage of eucalyptus trees. Some Cuban cedar trees (*Cedrila odorata*) were so thickly covered with the larvæ of a froghopper (so enveloped in woolly matter that they looked like mealy bugs) that some of them were killed. A number of aleuroyds were found upon different trees. On the 12th, with Mr. Horn, of the Experiment Station, I went to the Guines district, where there is a heavy black soil. The small holders grow the tomatoes, and sell them to the American packers at from 4s. 2d. to 6s. 3d. per bushel at the packing sheds, which, when shipped to New York and Chicago, usually bring 16s. 4d. per bushel. The tomatoes are of the stone variety, and are hard and green when packed. Large quantities of cabbages, onions, and green peppers, and other vegetables are also grown in this district. The chief disease of the tomato is a fungus that forms discoloured black blotches beneath the skin. It is said to be caused by the tomatoes resting upon the ground when the land is irrigated. The tomato packing lasts from December to the end of May. We also visited one of the largest sugar-mills in this district, "La Providencia," where they have been growing cane on the same land for over 100 years without any fertiliser. This estate has about 800 caballarias (over 160,000 acres); but only part of it is in cane. The output is 13,000,000 arrobas of sugar (an arroba

is 25 lb.), and the mill is a very large one, with modern machinery. The cane-fields were full of long-horned grasshoppers, and in the village, round the electric lights in the square, there were thousands of them flying about.

On the 15th December, 1907, with letters of introduction to leading planters at Cienfuegos and Santiago de Cuba, I left Habana, and reached the town of Cienfuegos, 195 miles south, at 6 p.m. Next morning, with an interpreter, I called upon the manager of one of the largest plantations; but found he had left the night before for Santa Clara. His chief clerk arranged to send word to him, and I should get word early next morning. In the meantime I visited a large experiment garden some 6 miles out of town, owned by a wealthy Cuban, Signor Calvado, where he had all kinds of tropical plants and fruits growing. As we could not get in touch with my man next morning, I left in the afternoon for Santa Clara, where I stopped the night, and caught the mail train for Santiago de Cuba at 6 a.m., reaching that town at 10 p.m. the same evening. Next morning I visited the British Consul, who gave me letters to several representatives of the large plantations in the district; but in the meantime the secretary of the United Fruit Company's Boston Plantations called upon me, and invited me to go out with him to Banes, about 100 miles north. We left at 6 a.m. next morning, and after changing trains at several junctions, reached the plantation at 3·30 p.m.

The United Fruit Company first laid out this country as a banana plantation; but found that it would not grow fruit, so planted it with sugar-cane, and now have 20,000 acres of sugar-cane ready to cut, with 60 miles of railway laid through the fields. I travelled all over the estate with the manager, and saw several small plantations of citrus fruit that were very free from pests. While here the British Consul sent me word that the boat to Jamaica was to sail a day earlier than advertised, and that the quarantine between Jamaica and Cuba, on account of yellow fever, had been raised that day. I left at 2 p.m., 22nd December, 1907, for Santiago; but was delayed seven hours (a common thing on these lines) at Cedro Alto, and did not reach my destination till the following morning.

Left Cuba at 4 p.m. for Kingston, Jamaica, by the s.s. "Oteri," and arrived there next morning at 8 a.m. This was Christmas Eve, and all the officials were out of their offices until the 27th, when I went up to Headquarters House, and presented my credentials to the Colonial Secretary, the Honorable T. Bourne, who gave me a free pass on the railways, and sent me to the Honorable I. Faucett, the Director of Botanical Gardens, Forests, &c. At Hope Gardens I obtained a great deal of information, and received letters to a number of different planters. The following day I took the train to Port Antino (79 miles by rail), and next morning drove out to Burlington, and called upon the Honorable H. Cork, who showed me round his estate. He had 24 acres of coco-nut palms in full bearing, every one which was destroyed

in the hurricane of 1905, which swept over this side of the island. Coco-nuts are worth 8s. per hundred for shipment, and 11,000 were exported to America last year, while there is a large local consumption. Port Antino is the chief centre of the banana industry. In 1896 there were only 19,227 acres in bananas, which had increased to 44,325 acres in 1905. Last year Jamaica exported 16,000,000 bunches of bananas to the United States and Europe (a bunch consists of from 12 to 9 "hands"; anything smaller is counted as half a bunch). The value of the exported bananas was £880,000. The bulk of these fruits are consumed in the United States, and the United Fruit Company controls everything. Jamaica also exported 32,000 packages (in barrels or Florida fruit-cases) of grape-fruit, worth 6s. per package, and 55,000 packages of oranges, worth 2s. 6d. per hundred. I might here remark that the United Fruit Company practically controls the markets of the United States, and nearly all fruit in Florida, Cuba, the Central American States, and the West Indies passes through their hands.

The large banana growers, Mr. Cork informed me, use sulphate of ammonia as a fertiliser, and find it pays them.

Left the same afternoon for Bog Walk, the junction for the Ewarton line, and stopped there that night. Monday morning left by the 8 a.m. train, reached Ewarton at 9·30, and took a trap out to Worthy Park, 8 miles over the mountains, and reached there before lunch. Mr. J. V. Calder gave me a warm welcome, and found me a horse and guide to go through his cacao plantation, one of the largest in the island. This at present prices is a very profitable crop; but the trees are subject to a number of different insect and fungus diseases. For the first three years of life, a cacao-tree has to be grown under shade, and looked after; but when firmly established is a very hardy plant. Many growers claim that cacao should always be grown under shade; while others claim that if the trees are properly planted 12 to 18 feet apart, and properly pruned, they will grow enough shade to protect themselves, and that the planting of shade trees causes the many diseases that attack them. One of the most serious diseases is "canker," which attacks the main stem. Starting as a diseased pustule under the bark, it spreads all round, and if not cut away, and treated with a dressing of fish-oil and tar, it will very soon kill the tree. "Black-rot" attacks the growing pods, and if they are not cut off it spreads into the stem wood, and kills the flower-bearing wood. Thrips first appear among the foliage, and then spread down into the growing pods. When numerous, they damage the skin, and cause the pods to become aborted and the beans inside to perish. The rats also damage a good many pods, and the woodpeckers often bore holes into them and suck out the beans. In Trinidad the leaf-cutting ant often does some damage, and two beetles (*Steirastoma depressa* and *S. histronica*) lay their eggs in the bark, which the larvæ damage considerably. In this island, besides the rat, there is a squirrel and a rat opossum which damage the pods.

The cacao industry in the West Indies was valued in 1905-6 at £1,500,000. It is the sole crop of Grenada. In Trinidad it is worth double the sugar output, and is a large industry in Jamaica, St. Lucia, Dominica, and St. Vincent. The average yield in Grenada is 784 lb. to the acre. Mr. Calder is also planting out a considerable amount of rubber trees; but none of them are of commercial value up to the present.

I also visited the sugar-mill, where about 500 tons of sugar is turned out every year; but nearly all the mills in Jamaica make their profits out of the rum they distil, while the sugar pays their working expenses.

Next morning I came down by train to Spanish Town, and from there took a trap to Hartlands Estate, where Mr. A. Wigens, managing partner, took me all over the citrus orchard of 190 acres. This estate was first planted with bananas; but it was found that they would not do in the heavy black soil, and citrus fruits were substituted. The greater part consists of grape-fruit, with some Royal oranges (a mandarin with a very coarse skin), Navel, and other oranges. The whole place is irrigated by gravitation. Here, as in Cuba, melanose is very bad, while "white louse" (*Chinaspis citri*) and "round scale" (*Aspidiotus ficus*) are very abundant, often covering the fruit. Canker, somewhat similar to "collar rot" with us, and probably due very often to the same cause—want of drainage—is very common, but is kept under with cutting away the diseased tissue, and treating with a mixture of fish-oil and tar.

Spraying with Paris green and lime, salt, and sulphur is regularly carried on in this orchard. Mr. Wigens ships a good deal of his fruit direct to England.

New Year's Day, left Hartlands at 10 o'clock and reached Montigo Bay at 6 p.m. This is another banana district, and there are a good many small sugar mills in the district. A very large, flat, bright-red mandarin is grown about Manderville on the road from Hartlands; the skin, however, is very loose, and I was told it would not travel well. This is the only place where I came across this distinct variety. On the following day I left Montigo Bay for Kingston, reaching there that evening, and packed up my luggage to leave next morning for Barbados; but my boat did not leave till early on the 4th. After calling at Colon (Panama), Savenilla (Pt. Coloumbia), La Guayra, and Trinidad, we arrived at Barbados on the evening of the 14th. On board the R.M.S.P. La Plata I met the delegates to the Imperial Department Agricultural Conference of the West Indies, Messrs. Faucett, Williams, and Savage, and also, later on, those from Trinidad, Messrs. Hart, Collins, Tripp, and Clarke, who, when we met the reception committee, introduced me to Sir Daniel Morris, who, as soon as I explained my mission, nominated me as an honorary member of the Conference. During the week that the Conference was sitting I met most of the leading agriculturists and teachers representing nearly every island in the West Indies, and learnt more from them than I would have been able to do in a month otherwise. The chief industry in Barbados,

till this last few years, has been sugar; and the island is dotted over with small mills, many of which are worked with windmills. Within this last year several mills are fitting up with modern machinery, and propose to buy and crush cane on the co-operative plan. Last year (1906) Barbados exported 50,630 tons of sugar, while the total output of the West Indies and British Guiana was 254,118 tons, valued at £2,157,147. The revival of the cotton industry in the West Indies has been one of the most important events of the last few years, and the total area now under cultivation is over 24,000 acres, chiefly in the islands of St. Vincent, Montserrat, Nevis, Antigua, and Barbados. On the latter, 6,935 acres are under cotton, the value of the crop being estimated at £120,000. There is a co-operative cotton ginning mill in Bridgetown which was completed last year, which is said to be the largest Sea-island cotton mill in the world. Sea-island cotton is a very profitable crop, bringing up to 2s. 6d. per lb.; one lot from St. Vincent bringing as high as 2s. 8d., or 64 cents per lb. Cotton has a number of enemies, though there is nothing like the American boll weevil in the islands. The most destructive are the two cotton worms, *Aletia argillacea* and *Aletia lividula*, which attack the foliage. These pests are controlled by the dusting of the foliage with dry Paris green mixed with lime. The boll worm larvæ of two common moths (*Heliothis armiger* and *Laphygma frugiperda*) also damage the bolls. Cotton aphis, I am told, however, is one of the worst pests at certain seasons, and as it attacks the under surface of the leaves, is difficult to destroy. A scale insect (*Lecanium nigrum*) at times is very abundant on the twigs, and "Red Maggot," the larva of a Cecidomyia fly, congregate under the decaying bark of any branchlet attacked by fungus disease. Lately another species of Cecidomyia fly has been found depositing her eggs in the flowers of cotton growing at Antigua, the larvæ of which are said to feed upon the pollen and cause the flowers to drop.

Montserrat and Dominica are the chief islands where limes are grown for the manufacture of limejuice and citrate of lime, and the value of these products from these islands in 1906 was £62,057. In Montserrat there is a plantation of 2,000 acres. All of these trees are very much infested with scale insects, chiefly white louse (*Chinaspis citri*) and brown olive scale (*Lecanium oleæ*). It is said that the whole of the forest trees are scale infested; and the country is so rough that the trees, which interlace overhead, could not be sprayed or fumigated. I found no evidence of fruit-fly in any of the islands; but obtained a report upon the action taken by the Government in Bermuda to deal with the fruit-flies in that island. Early last year (1907) the Governor passed an Act entitled The Fruit Fly Destruction Act, which was administered by Mr. T. J. Harris, Director of the Public Gardens of Bermuda, who furnished a report upon the work done up to the middle of August. The Act came into force on 1st March, the Legislature having granted the sum of £500 for the purpose of carrying into effect the recommendations of the Board of Agriculture, namely: "that an attempt be made to eradicate from this island the insect pest known as the fruit-fly (*Ceratitis capitata*)."

As trees are fruiting all the year round in Bermuda, and the flies attack all kinds, first appearing in the loquats in February and March, following into the citrus fruits, peaches, &c., in April and May, and other fruits right into December (winter time in Bermuda), they are very difficult to deal with. The Government undertook the work, purchased tools and appointed an inspector for each of the nine parishes, with an additional one for Hamilton parish, on account of the rugged nature of part of the parish, or, in all, ten inspectors were appointed. Trees were pruned back hard, all fruits punctured or fallen were destroyed by collecting them in sacks, weighting them with stones and throwing them into the sea. When more convenient, the fruits were burnt or boiled. It is too early to see the results of this work on the island; but, according to this report, Mr. Harris claims that there are fewer fruit-flies in the orchards than there have been for many years at this season.

Regarding other legislation dealing with insect pests in Jamaica, since 1901, fumigation of all incoming plants has been in force under a proclamation in the Act of 1884—Seeds and Plants Importation Law—which was brought into force to deal with leaf disease of the coffee in Ceylon. At the present time six fumigators are in use at the wharves, post office, and Government gardens.

In Trinidad the Legislative Council passed an ordinance which enables the Governor to declare certain districts infested with leaf-cutting ants (*Atta—cecodoma—cephalotes*), and thus enable planters to take means for their destruction. There is also an ordinance in Trinidad dealing with the large plague locust that at times does considerable damage in the grass lands. In each large town visited I have made a point of going through the native fruit markets and seeing and sampling the different kinds of fruits, but propose to write a general report dealing with them on my return.

I also examined all the different insect collections. In Mexico I only found one, made by a local entomologist at Puebla, in the museum of the University of State. In Habana I went carefully over the very fine collections made by Dr. Gundlach over fifty years ago, and still in good preservation in the museum attached to the Instituto de Secundo Ensenanza de la Habana. There is also a collection in the old Belen church, which is one of the largest Catholic colleges in Cuba. I called upon the Father Director, but could not see what the collection contained as the priest in charge was away. At the Agricultural Experiment Station, through the kindness of Messrs. Horne and Housen, I obtained a fine series of all the economic insects in their collections. At Kingston, Jamaica, I visited the Jamaica Institute, where, in the museum attached to the library, are two cabinets containing a collection of Jamaican insects chiefly gathered together by Messrs. Cockerell and Taylor Townshead when they were curators of this museum.

In consequence of the outbreak of yellow fever in Trinidad I was unable to land, and did not see Mr. Urich's collections. At Barbados I went

through the economic collections in the Imperial Department of Agriculture, made by Mr. Ballon, and obtained some typical specimens from Mr. Bovell, Superintendent of Agriculture for Barbados, and also had the pleasure of seeing Mr. Edwards' collections at Christchurch, and Mr. Barnes' at Codrington College.

Stock Diseases.

In Santiago de Vegas I found that the fowl tick (*Argas americanus*) was very common wherever poultry were kept, and was generally distributed over the island. In Jamaica it is also very common, and is probably widely distributed over the West Indies; but as there is little or no trade, except for local consumption, nobody appears to take any trouble with their poultry yards.

The cattle tick (*Rhipicephalus annulatus*) is common in Cuba both upon cattle and horses, and any stock feeding upon open pastures are more or less infested with them; but as a general rule little attention is paid to them, though Dr. Mayo, at the Experiment Station, informed me that the department are going to build several dips after our plans, as they find they cannot use the oil smears, used so much in the United States, on account of the heat of the sun. The cattle tick is also found in Jamaica, and there are also a great number of indigenous species found in the different West Indian Islands.

Another very serious disease in Cuba is tetanus, which attacks both man and beast. The natives are very careful about their feet when travelling, and, unlike Mexico, always wear boots or sandals, for injuries to the feet are very liable to bring on lockjaw. It is quite a common thing for a mule if it gets staked in the feet to develop this disease. Dr. Mayo says that rest and treatment with strychnine are the most effective remedies.

Thrush in the frog of the forefeet is another troublesome disease in the wet season, and, if neglected, the hoof rots. Treating with carbolic or creoline and packing the diseased parts cures it in time.

I have, &c.,

(Sgd.) WALTER W. FROGGATT.

The Hon. the Minister for Agriculture.

The Growth of Black-spot on Cased Fruit.

H. M. NICHOLLS,
Huon River, Tasmania.

THE question arises from time to time as to whether the disease known as Black-spot or Apple-scab (*Fusicladium dendriticum*), is capable of developing on apples after they have been picked and placed in cases, and quite recently many growers have claimed that although their apples were quite clean when packed, they were spotted with the disease when the cases were opened after a steamer voyage. This has been strenuously denied by some authorities, who contend that directly the apple is picked the disease ceases to develop, so that at present there is considerable doubt in the minds of fruit-growers on the subject. With a view of finding out the true facts of the case, the writer recently undertook an extended investigation, with an unlimited supply of material at hand, and the results arrived at show that the apple-growers are, to a certain extent, right in their contention. It must be borne in mind that the disease is produced by a minute fungus, which grows immediately beneath the skin of the apple. At first it consists of a single filament, the germ-tube of the infecting spore, which penetrates the skin, and commences to develop beneath it. It soon expands into a mycelium of flattened cells, which branches out into tree-like growths. As the fungus matures, dark-brown cushion-like masses of cells are formed on the mycelium, and these put out dense clusters of conidiophores, each of which bears a single terminal spore. The conidiophores rupture the skin of the apple, which disappears from the diseased area, and the closely-packed masses of dark-brown spores give the characteristic black-colour to the spots or scabs. Where the conidiophores are densely packed together, they are long, and colourless in the middle of their length for some distance; but where they are not so crowded, as in the rejuvenescence of old spots, they are very short, and dark-brown throughout, and often curiously clubbed at the apex. As the disease progresses, fresh masses of spores are produced round the edges of the spot, which enlarges in a roughly circular manner. As hot and dry weather comes on, the fungus ceases to produce spores, and as those already produced have fallen away, the dark colour of the diseased spot gradually disappears, and nothing is to be seen but a brownish surface of dead cells, the pulp-cells of the apple which have been destroyed by the operations of the fungus. This is the means by which the fungus destroys the value of the fruit, as the removal of the skin and the killing of the surface layer of cells prevents its development, and leads to cracking and distortion.

The mycelium extends for a comparatively long distance from the spot, all round the edges, underneath the skin, but its presence is not perceptible to the unaided eye until it produces conidiophores. It retains its vitality,

however, and when favourable conditions again arise, such as moist and still weather, it resumes spore-production, and the spots again become black.

It very often happens, however, that unfavourable conditions for late spore-production arise, and when the diseased apples are picked, the grower sees nothing upon them but light-brown dried-up scabs, which do not resemble the familiar Black-spot, and are mistaken by him for the work of an insect, or the roughness attributed to spraying by Bordeaux mixture. But when these apples are placed in the case with others, the still and moist atmosphere they meet with provides the very conditions required for the resumption of spore-production. Conidiophores and spores are again produced, and the spots become black, and the disgusted apple-grower comes to the conclusion that the "spot" has appeared since the apples were picked. Fungi, it may be remarked, are able to develop independently of light, so that they are not affected in the least by being shut up in the dark. The spores produced in this manner are often curiously distorted, and the majority of them germinate on the surface of the spot or on the skin of the apple, and perish. Those that do not germinate at once appear to be sterile, as the writer could not induce any of them to put forth germ-tubes. Where the conditions are favourable for late spore-production while the apple is still on the tree, no further development takes place after the apple is picked. The late crop of spores is produced in the normal manner, and the fungus quietly retires from business to wait the time when the rotting of the fruit (if it is allowed to rot) enables it to assume its saprophytic or winter form.

The fungus, in its fusicladium form, seems to have a definite course to run, and a definite amount of energy to work off, and if it cannot do it naturally in the orchard it will do it after the fruit is picked. Last year nearly every apple-grower in Tasmania was complaining that the spot had appeared on apples after they were picked, especially in the case of Scarlet Nonpareils, and the writer was amongst those that suffered. Case after case, in which the apples had been, to all appearances, quite free from disease when picked, were found quite valueless after a few weeks in the apple store. Many of the apples were covered with large black patches, where none had been seen before Investigation showed, however, that in every case the disease had already existed on the apple before it went into the store, and that it had simply enlarged and developed there. Every spot showed a centre of dead apple-cells, sometimes not as large as a pin's head, and sometimes so small as to be invisible without microscopic aid, from which the disease had extended. These dead and hard cells ("cork-cells," as they are sometimes loosely termed) show that the parasite must have commenced operations while the host was capable of exercising its vital functions, as cells of this nature are produced by the fruit as a defence against invaders. A ripe apple has, to all intents and purposes, ceased its life, and if attacked by a parasite would simply rot without any attempt at resistance. It is clear, therefore, that the disease must have attacked the apples while physiological operations were in full force, and then received a check, which prevented its development until the

culture-chamber conditions of the fruit-store once more roused it to activity. Such a check would be given by a dry summer and autumn.

In many cases the mycelium had extended for half an inch in every direction from the original centre of infection, and had turned quite black. It always consisted of the usual pavement of flattened cells, extending under the skin in dentritic ramifications, with here and there protruding tufts of conidiophores, bearing the characteristic spores. These spores in nearly every case had germinated in falling from the conidiophores, and had put out long germ-tubes, which interlaced with others. They were all incapable of further development under any conditions they would be likely to meet with in an orchard. Sections across the patches of fungus showed that, in many instances, there had been a departure from the normal habit, and the mycelium, instead of growing under the skin, had spread copiously over the surface, even producing spores in that situation. In none of the spots examined, which numbered several hundred, was anything found to show that the disease had originated since the apple was picked. What was abundantly demonstrated, however, was, that under certain conditions, a microscopic spot might enlarge itself to an inch in diameter in case or store, and thus lead to the assumption that it had developed on an apple that was clean when gathered.

There does not appear to be any direct danger of infection from the spores produced in cases. In fact the writer's investigations have led him to the conclusion that *F. dentriticum* is essentially a leaf disease, and that its presence on the apple is simply an accident, and in no way necessary to the perpetuation of the fungus. It is very doubtful if the apple is capable of receiving infection, except during its early stages, and it is still more doubtful if the Fusicladium spore is capable of infecting it at all. It is the spore of the winter form, *Venturia inæqualis*, which develops in the dead leaves after they have fallen, that appears to initiate the disease each spring, and there is a good deal to show that it is only by means of the Venturia spore that the Fusicladium form is conveyed to the apple fruit.

It is undoubtedly the case that Black-spot will increase and spread on cased fruit, by the enlargement or recrudescence of already existing spots, but nothing was found to show that the disease was able to develop *ab initio* under such circumstances.

J. Cheal, the English authority on fruit-growing, in his work on "Fruit Culture," describes the disease under the name of *Cladosporium dendriticum*, and states: "The fungus continues to spread after the crop has been stored in the fruit-room, and greatly depreciates the market value of such produce."

Notes on Grasshopper (or Locust) Swarms in New South Wales during 1907-8.

WM. B. GURNEY,
Assistant Entomologist.

GRASSHOPPER swarms having caused much damage to grass and crops at intervals during the twelve months up to March, 1908, a summary of the habits, dates of appearance, and methods employed here and elsewhere against these pests will, perhaps, be of use, and suggestive to farmers and stock-owners.

The species most widespread and destructive during the period above-mentioned is *Chortoicetes terminifera* (see Fig. 1). Belonging to the family *Acridiidæ*, it is a short-horned grasshopper, or locust, in the true sense of the latter word, and not, of course, to be confused with the singing Cicadas—the so-called locusts of the coastal districts of New South Wales

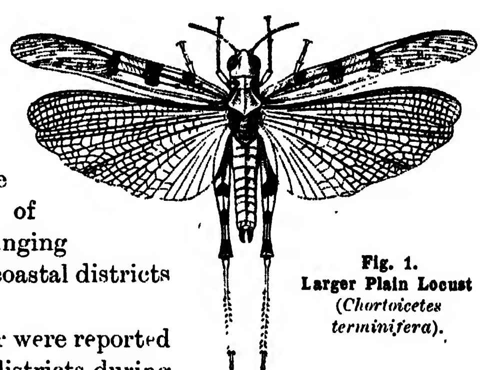


Fig. 1.
Larger Plain Locust
(*Chortoicetes terminifera*).

Winged swarms of this grasshopper were reported to have appeared in certain western districts during March and April, 1907, and spread from the Darling River eastward to the Bogan and Macquarie Rivers. They damaged crops here and there in their course, and finally deposited their eggs in the ground, and were noticed to congregate and lay in certain defined patches; sometimes in cultivation paddocks, but frequently on bare patches in the grass paddocks, roadsides, &c. The enormous numbers of eggs thus deposited gave rise to the swarms of tiny hoppers which appeared in September and October, 1907, and spread in armies from their various egg-beds upon the surrounding grass or crops. During these months reports were received of their appearance, and the damage they were doing, from Dandaloo, Trangie, Narromine, Nevertire, Coonamble, Dubbo, &c.

Visiting Trangie and Coonamble during the first week in October, I found the grasshoppers in various stages of development, from tiny, recently-hatched hoppers to almost full-grown specimens, and odd mature (winged) ones. They were not travelling in any definite direction, but spreading in dense swarms, and so numerous that the ground appeared to move and quiver as one walked through them. While young, and with a fair food supply, they advance in irregular lines; as they get older, or where the grass supply is short, it seems they scatter somewhat, though still congregated in patches. Within three weeks of my visit great numbers were on the wing, and throughout the

districts mentioned plagues of flying swarms occurred, destroying crops and grass that had escaped the immature hopping swarms. They invaded towns and homesteads, swarmed into the streets and houses, damaged furniture and food, destroyed the foliage of trees and plants in the gardens, crowded into wells, and were sometimes massed in heaps and layers from a few inches to a foot or more in depth. Where they accumulated on the railway line, the large quantities crushed beneath the trains rendered the rails and wheels so slippery as to temporarily prevent the advance of several trains.

General Life-history of a Grasshopper.

The female inserts the hind-body (abdomen) into the ground by working the two pairs of short, hard, ovipositor valves at the extremity of the abdomen. Even hard soil of roadways and tracks may be penetrated, and bores, varying according to the soil from an inch to three inches in depth, are made, in which the eggs are deposited. As before mentioned the egg laying is commonly effected by the swarm in comparatively limited patches of ground, varying from a few square yards up to several hundred square yards, depending upon the size of the swarm. A frothy liquid secretion is exuded with the eggs, below, around, and above them, which hardens into an irregular sheath of a spongy and papery nature, and protects the eggs somewhat from other insects, and the effects of moisture. The eggs, 20 or more in number, are deposited in transverse rows of four, with the longer axis of the eggs running parallel with the bore, and pointing towards the surface, to which the newly hatched hoppers immediately make their way.

Immature stages -The recently hatched insect is delicate and small (about one-sixth of an inch in length), shaped like the adult insect, but with no trace of wings showing. Six legs are present as in the adult, but at this stage it can leap no more than two or three inches. It is variously whitish, brown, grey, to almost black in colour.

As the insect feeds it develops in size by a series of moults. The period occupied to pass through the first three stages is about three weeks. The next stage occupies about ten days, and the duration of the following stage is two to three weeks. These last two stages are marked by the presence of wing-pads or rudimentary wings on the thorax (see Fig. 3).

The adult or winged form is the next stage (see Fig. 1), and it is brown in colour, the fore wings marked with dark brown blotches, the hind wings transparent, the tips being marked with a smoky blotch. Once winged the insect never grows larger, and though somewhat variable in size, measures usually about 1¼ inches from the head to the tip of the folded wings. Variation in the size of individual specimens is probably due to the amount and quality of food available during the immature stages. The females are generally somewhat larger than the males. The adult lives for a period of about six weeks, and may deposit several batches of eggs.

As the immature stages occupy a period of about seven weeks, the total length of life from the hatching of the egg is about thirteen weeks.

When the adult stage is reached, the insects may move in swarms by a series of short flights of a few hundred feet at a time, or rising higher into

the air, pass across miles of country, usually taking the direction of the wind, and avoiding timbered stretches when settling again.

Experiments to destroy the younger stages.

At Trangie several parts of the district were visited, and with the assistance of Messrs. McDowell, J. D. Boyd, and Rev. W. G. Sharpe, some experiments were made with kerosene emulsion and poisoned baits. A spray of 1 gallon kerosene to 5¼ gallons water with 1 lb. hard soap was tried on patches of grasshoppers about half grown, and which destroyed about 50 per cent. of them. While the younger ones were readily destroyed, many older specimens were noticed to eventually recover from the effect of this contact spray. Strong soap and water was also found to destroy numbers of the smaller specimens. The insects are at once incapacitated as they become wetted by the spray, and it may be considered from the results obtained that kerosene emulsion applied on the patches of young hopper not later than three weeks after hatching, and before they have become too scattered, would be effective.

A kerosene emulsion made from the following formula is recommended:—

Kerosene	1 gallon
Soft soap	2 lb.
Water	10 gallons.

The kerosene and soap should be well emulsified in two or three gallons of hot water before adding the rest of the water.

Poisoned bait, consisting of Paris green and bran mixed in the proportion of 1 to 10 and made into a mash with water sweetened with treacle, was spread at the edge of a cultivation paddock, and destroyed numbers of the hoppers. As the bait dries it is less attractive to the grasshoppers.

Visiting Coonamble, experiments were made with Mr. McKenzie, Calga Station, with an emulsion of Little's Dip (a carbolic sheep-wash), as follows:—

Little's Sheep Dip	1 gallon
Soap	3 lb.
Water	20 gallons.

This destroyed the hoppers as soon as they were wetted by the spray, though it was found in the case of some of the larger hoppers that they recovered from the wash, though rendered helpless for hours by the film of oil and soap.

The results of these experiments show that there are certain stages when the hoppers may be destroyed by the use of the above-mentioned sprays.

Fig. 2 represents the stage and size when these sprays can be effectively applied.

Fig. 3.
Stage too old for contact spraying.

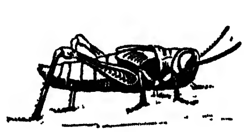


Fig. 2.
Stage when contact spraying effective.

Fig. 3 represents a stage when the wing-pads are developed, which is too old for the best results from spraying.

At Trangie a heavy log roller was used on a swarm of young hoppers advancing over a cultivation paddock. It destroyed a small percentage only, as the ground was too irregular and hard, and the roller passed harmlessly above many. With a heavier roller and more favourable ground this method might be of value for use over limited areas.

Concerning arsenic sprays reported to be applied with success in South Africa, it may be pointed out that though grass poisoned with this spray destroys the hoppers readily, it cannot of course be used on grass or in cultivation paddocks where stock is run. This fact limits its use here to paddocks closed to stock, or where a strip along the edge of a crop is sprayed. This latter method destroys a large percentage of the hoppers advancing into a crop before they have entered far. A strip of grass in the line of advance of the hoppers may similarly be sprayed with arsenic, but needs to be temporarily fenced off from stock. Temporary barriers of, say, a 3-foot bagging or brush fence, act as checks to moving hoppers and assemble them, when they can be treated by contact or arsenic sprays, or the use of hopper-dozers described later. Light fencing around the egg patches would allow of spraying with arsenic and destroying the young hoppers as they hatch and feed, without danger to stock.

Some spray seems required, however, that will destroy hoppers and yet not be harmful to stock. It was noticed that grasshoppers in the breeding cages readily drank water sprinkled on the grass. This suggested testing some solutions that might destroy the hoppers upon their drinking a small quantity. A solution of potassium cyanide quickly destroyed them, but this is open to the same objections as arsenic solution. I made a few trials at Muswellbrook through the kindness of Mr. Jas. White. Powdered borax having been used in destroying cockroaches, a solution of ¾ lb. borax, 2 lb. treacle, to 6 gallons of water, was sprayed at midday on the grass about a small swarm of half-grown hoppers. Also, a spray of 8 oz. sulphuric acid, 2 lb. treacle, to 6 gallons water, was tried. There was no apparent results obtained from the use of these sprays, and they were found to dry too quickly in the sun.

Burning over the egg patches where the hoppers are hatching is effective, dry grass or straw being used. Apart from the danger of grass fires, this method could not be used over large areas, though of great value in checking the spread of local swarms. At Tocal, near West Maitland, Mr. F. Reynolds practically wiped out the hatching hoppers by setting men to burn over the egg patches in his paddocks with fire-brands. Each brand consisted of bagging soaked in kerosene, and wrapped tightly around a six or eight foot rod. When lighted they were swept to and fro by hand, and the egg patches were one by one treated in this fashion, the tiny hoppers being killed in hundreds at every stroke. Had the hoppers hatching in the neighbouring paddocks been treated similarly, good results could have been expected in this district. As it was, however, within a few days afterwards, the grasshoppers spread across from adjacent properties and the good results of Mr. Reynolds' efforts were somewhat lost.

Winged swarms appeared in the Hunter River Valley in October and November, and young hoppers did considerable damage during November and December.

The grasshoppers at Muswellbrook were reported to have fouled the so-called "blue couch" grass and caused the death of a number of cattle. No fouled grass was obtainable, and on visiting soon after no trace was left of the presence of the hoppers. Rain had followed immediately after the mortality and may have removed the cause of the trouble. However, inquiries revealed that this grass has previously affected stock, and that when no grasshopper swarms had been in the district. Further, other grass attacked by the swarms apparently had no effect on the cattle. It seems probable, as Mr. Stewart, the Chief Inspector of Stock, reported, the cause of the fatalities might be traced to the animals, having been starved for lengthy periods, being allowed to drink and then depasture on so-called "blue couch" grass.

Fly-parasite of the Grasshopper.

At Tocal I found a number of the winged grasshoppers affected with the maggot of a parasitic fly (*Sarcophaga pachytyli*). One generally, but occasionally two maggots were found in the one grasshopper, feeding internally within either the thorax or the abdomen. The grub was a white, fleshy maggot, ¼ to ⅓ of an inch in length. When fully grown the maggot eats its way out and falls to the ground, where it burrows slightly and pupates. The pupa is brown, cylindrical in shape, and hatches after a few days as a two-winged adult fly. The adult is greyish, in size and general appearance resembles a house fly, and again lays eggs upon grasshoppers, &c.

Number of broods of the Grasshopper.

Judging from the times of appearance recorded, it appears there may be three generations during the season, the first hatching during August, September and early October, the second appearing in November and December, the third batch of young ones about February and March. This means the main swarms are on the wing during late October and November, during late December and January, and about March and April. The eggs from these last swarms apparently remain unhatched through the winter months. The eggs deposited during the summer months hatch in about three weeks' time. On this point I obtained interesting information from Mr. F. S. Walker, Bungiebomar School, near Dubbo, who reported the appearance of winged swarms there during November, and noticed them congregated on his vegetable garden and laying eggs. On writing for the dates of the egg-laying and hatching of these eggs, he replied, 28th November and 16th December respectively. This makes a period of incubation of about eighteen days during summer.

The pest appeared irregularly throughout the State from New England districts in the north to the Riverina in the south. The first winged swarms apparently advanced eastward further than is usually the case, perhaps owing to the great shortage of grass in the western districts during early summer.

They appeared in the New England districts, in the Hunter River Valley almost to the sea, and in the south as far east as Queanbeyan and Tumberumba, &c. Odd specimens of *Oedaleus senegalensis* and *Cyrtacanthacris exacta* were observed among the swarms of *Chortoicetes terminifera.*

Other Species of Australian Plague Grasshoppers.

The "Smaller Plain Locust" (*Chortoicetes pusilla*, Walker) is about an inch in length from the head to the tip of the wings, brown or yellowish in general colour, without the distinct blotching on the forewings and tips of the hind wings, as in the "Larger Plain Locust" (*C. terminifera*), and decidedly smaller than this latter species. During the summers from 1899 to 1902, it appeared in the western districts from Parkes and Condobolin south to the Murray River. Grass and crops were destroyed. Among other methods employed to destroy the hoppers, Mr. Froggatt used African fungus, but without appreciable results. The curious manner in which the males group about the female as she is depositing eggs is well shown in the plate (reproduced) which appeared in a paper by Mr. Froggatt on this species.

Eastern Plague Locust of New South Wales (*Oedalus senegalensis*).

Individuals of this species may be found each season throughout eastern and central New South Wales, but in March, 1907, they appeared in large swarms about the Singleton districts, and were observed depositing eggs in quantity. They were observed by Mr. Froggatt to be attacked by a fly parasite; also, a parasitic fungus (*Empusa grylli*, Fres.) was reported destroying numbers of the winged forms. Later a hymenopterous parasite was bred from the eggs. They did not appear in great numbers this summer, 1907–8, and it seems possible this heavy infestation with parasites considerably reduced their numbers. Their place was taken at Singleton, Maitland, &c., by swarms of the Larger Plain Locust (*Chortoicetes terminifera*), which, as previously mentioned, flew eastward from further west during November and December, and deposited eggs from which young ones were swarming in January. In this species the base of each hind wing is yellowish, and there is a brown band across the centre and at the tip.

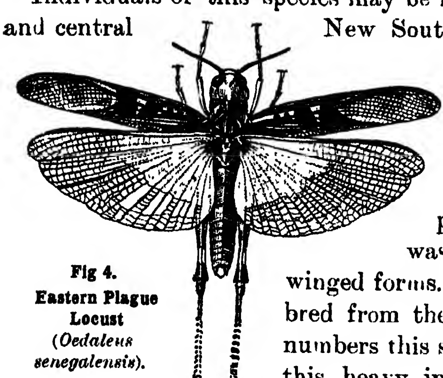


Fig 4. Eastern Plague Locust (*Oedaleus senegalensis*).

The Yellow-winged Grasshopper (*Locusta danica*, Linn.).

This species is found along the eastern districts of the State. In Queensland it sometimes appears in swarms, as also a larger species (*Cyrtacanthacris exacta*), and does much damage to the sugar plantations, &c. Driving into trenches or against cloth fencing along the edge of the canefields is resorted to, when they can be destroyed (sprayed, buried, &c.). This species is larger and of more robust build than the Plain Locusts (*Chortoicetes spp.*), and may

be distinguished by the bright yellow colour of the base of the hind wings and a broad central band of dark brown. Occasionally it is harmful in the vineyards and gardens in New South Wales and Victoria.

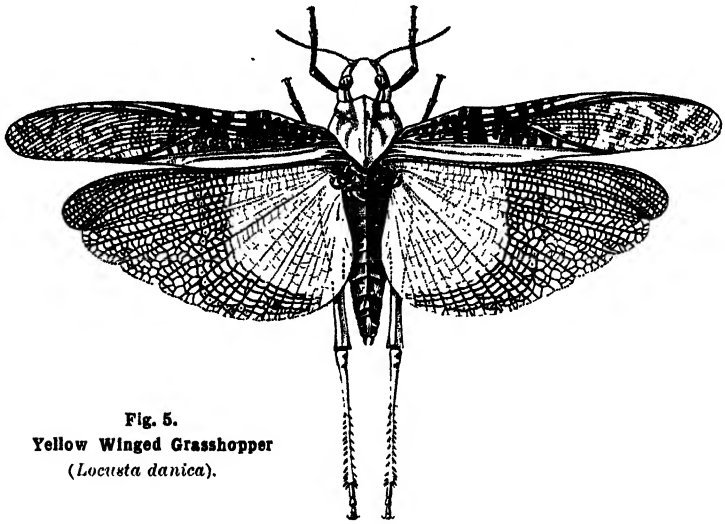


Fig. 5.
Yellow Winged Grasshopper
(*Locusta danica*).

Causes of Increase and Decrease.

Dry conditions apparently favour the development of grasshoppers, and with a series of dry seasons the grasshoppers are able to increase rapidly until wet seasons come, or the increase of internal parasites (flies), parasitic mites, internal worm parasites (*Gordius spp.*), predaceous insects (beetles, &c.), and insectivorous birds have their effect. The decrease of native insectivorous birds through useless shooting and other causes is probably directly aiding the increase of grasshoppers. Ibis, bustards (plain turkeys), wood swallows, even crows and magpies, are useful in destroying grasshoppers. The ibis seems particularly fond of them, and flocks of these birds may be seen feeding on the hoppers, and following the swarms day by day.

Increased settlement and clearing in the central and western districts has made the effect of grasshopper swarms more noticeable. In good seasons there is grass enough for both hoppers and stock, but the presence of the grasshoppers is felt severely during a scarcity of grass.

Remedies used over limited areas.

It may be well to briefly enumerate methods found more or less successful here and in America in destroying or checking swarms attacking crops, orchards, vineyards, and gardens :—

Scarifying egg-patches in the autumn, to expose the eggs to birds, insects, and frost.

Where the hoppers are noticed hatching these swarms should be destroyed at once by spraying, burning over, or use of rollers.

When young wingless hoppers are advancing on the crops, trenches, or cloth fencing 2 or 3 feet high, are made as temporary barriers to accumulate

the hoppers, which may then be destroyed by oil and soap sprays, burning over, or dragging a log through the trenches. Spraying a 10-foot strip of the edge of the crop with an arsenic spray (say 1 lb. arsenate of lead to 25 gallons of water) destroys a large percentage before they have done much damage. Similarly poisoned baits (bran 10 lb., arsenic 1 lb., with 1 lb. treacle, mixed dry, and made into a mash with water) can be used with good effect by scattering pellets along the edge of a crop. Corn-stalks, or grass, &c., cut and soaked in a strong arsenic solution also form effective baits. Care must be taken in the case of baits and arsenic spraying to prevent stock gaining access.

The foliage of larkspur (*Delphinium*) is found to poison locusts that feed on it, as also does the foliage of the castor-oil plant (*Ricinus communis*).

Strips of fire, and even grass fires where able to be controlled, have been used over small areas as a last resource to destroy dense swarms.

The "hopperdozer" is used about the breeding-grounds, in orchards and young crops, &c. These can be made any size on the principle figured in Fig. 6, and drawn by one or two horses. It consists in having a shallow iron

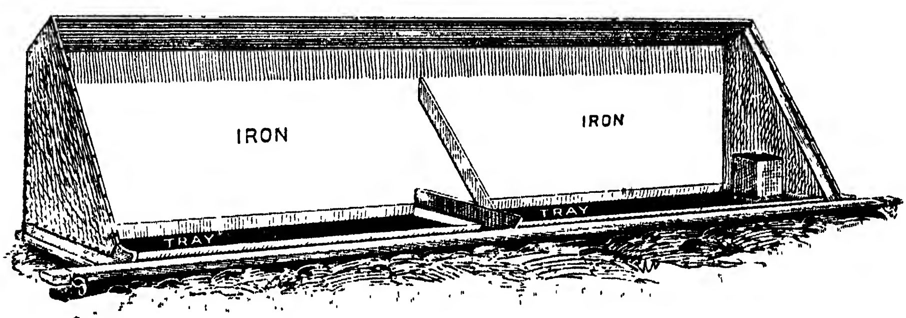


Fig. 6.—"Hopperdozer."

tray about 3 inches deep, anything from 6 up to 16 feet wide, and 2 or 3 feet from front to back. At the back a light framework bearing a cloth or light iron screen, as figured, is needed. Blue oil or kerosene is poured into the tray, and the hopperdozer drawn to and fro through the swarm. Great numbers are destroyed by hopping into the tray, or against the screen, from whence they fall into the oil. The dead ones soon accumulate, and the tray needs to be occasionally cleaned out and fresh oil added. Numbers may hop out again, but, once wetted by the oil, eventually die. The bottom of the hopperdozer should be mounted on several wooden runners, and a light pole fastened in front to trail about a foot in front of the pan and cause the hoppers to rise.

Winged swarms are difficult to cope with. Smudging—that is, lighting a line of smoke fires to the windward of a crop or orchard—frequently deters a flying swarm from settling.

Control Over Large Areas.

The spread of some fungus disease, such as *Mucor racemosus* *Empusa grylli*, by inoculating swarms, suggests itself as a cheap, inexpensive, and easy

THE PLAGUE LOCUST.

method of control. However, experiments here and in America and South Africa, have not shown fungus to be reliable. In isolated cases, and with warm moist conditions, swarms have been infected, but mechanical means seem as yet to have given the best results.

With reference to parasites, two fly parasites, *Sarcophaga pachytyli* and *S. aurifrons*, have been known to be attacking grasshoppers here for many years. It is not to be expected these parasites will annihilate their hosts, though towards the end of each summer they may increase sufficiently to affect a large percentage of winged grasshoppers. Most of the damage, and much of the egg-laying is accomplished before the effects of the parasites are noticeable. Similarly mites, egg parasites, and predaceous insects play their part in reducing the swarms. An increase in the host seems necessary before there is a marked increase of the parasite. But it does not seem consistent with the fact of a parasite being in existence that, under natural conditions, it should annihilate its hosts, and thereby itself.

Control of the swarms by mechanical means would require general action throughout a district. A scheme is necessary, embracing the marking-off of the egg beds in late summer when the swarms are laying, scarifying these to expose the eggs to frost, birds, and insects. Again the following spring the young hoppers hatching from the egg-patches should be sprayed with oil or carbolic and soap washes as before indicated. Each swarm destroyed then means the prevention of damage by that swarm and two vastly increased swarms it would produce later during the summer. Such a scheme would need organisation, inspectors, labour, spraying-tanks, fire-carts, &c., but in estimating the value and cost of such an undertaking the immense saving of grass and crops must be considered if some 50 or 60 per cent. of the grasshopper swarms were destroyed before doing any damage. In ordinary seasons there is often grass enough for both the stock and the grasshoppers, but in the dry seasons the supply is short, and the amount destroyed by hoppers may then be worth thousands of pounds to each large station.

REFERENCE TO PLATE.

Smaller Plain Locust (*Chortoicetes pusilla*, Walker).

Upper portion—Group of males about female as she deposits her eggs.

A.—1. Egg-bore.
2. Female in act of depositing eggs in egg-bore.
3. Eggs in sheath removed from egg-bore.
4. Eggs.
B.—Male with wing expanded.
C.—Side view.

METEOROLOGICAL BUREAU, No. 4 DIVISION, NEW SOUTH WALES.

Weather Conditions during March, 1908.

S. WILSON,
Divisional Officer.

AN unusually extensive and energetic monsoonal disturbance developed on the 2nd, with intensification over the northern half, where some heavy rainfalls were recorded. In Central Australia, Alice Springs had 208, Tennant's Creek 185, and Barrow's Creek 124 points. The largest amounts elsewhere in the storm area were Derby 308, Port Darwin 206 points; in Queensland Rotteston received 480, Thursday Island 396, Banana 298, Westwood 200, and Brisbane 175 points. Light to heavy rain was also recorded in coastal districts of New South Wales, and very light along the seaboard of the other States. The heaviest falls in our State were:—220 points at Bodalla, 134 at Wyong, and 130 at Nambucca.

The distribution of atmospheric pressure remained unchanged during the ensuing twenty four hours, excepting in the centre of the disturbance, which had gained two-tenths in barometric value. Further heavy rains fell in the heart of the continent, and in its Northern and Eastern parts; Warrina had 204, Charlotte Waters 190, William Creek 181, and Oodnadatta 118 points. As a result of this heavy rain, floods occurred in the Farina district. Derby, in the north-west, reported 260 points; and Cairns and Gympie, in Queensland, 161 and 140 respectively. In New South Wales some scattered light to heavy falls were recorded, 110 points at Nambucca being the heaviest. Along the south coast of Australia 36 points at Eucla was the largest amount.

The monsoonal area on the 4th expanded eastwards and southwards, but little or no grade was shown between its isobars. With the southward expansion light to heavy rainfall occurred in the northern districts of our State, and light in the south-east quadrant; 162 points fell at Casino, 128 at Tweed, 108 at Tibooburra, and 102 at Byron Bay.

Heavy rain persisted in the centre of the continent and over Queensland. Warrina received another 208 points, Charlotte Waters 200, Oodnadatta 109, and William Creek 120. In Queensland Mackay had 485, Douglas 326, Tambo 294, Alpha 194, Cairns 156, and Brisbane 134 points.

By the 5th the disturbance had extended as far southwards as the Great Australian Bight, and developed a cyclonic centre between William Creek and Charlotte Waters, whilst the rear portion of a high pressure which on the 4th was situated along the seaboard of New South Wales, Victoria, and Tasmania, experienced a retrogressive movement, and now covered the greater part of those States, thus preventing the easterly progression of the

disturbance. As the result of this distribution fresh to strong N.E. and E. winds and patches of rough sea occurred around the south-eastern seaboard of the continent. More heavy rains were recorded over Queensland, Central Australia, and South Australia. In New South Wales the heaviest falls were reported from coastal districts; Tweed Heads had 228 points, Maitland 214, Lismore 148, Raymond Terrace 126, Woolgoolga 119, and Byron Bay 111 points.

On the 7th two high pressures were shown on the chart; one covering the south-eastern States and portion of Queensland, and the other over the south-west corner of the continent, whilst between there were two depressions, the monsoonal and an antarctic. These pressure systems controlled the weather of Australia until the 14th, and covered practically the same area and maintained their respective characteristics throughout. Pulsations, however, occurred in their central isobars. The centre of the "high" over the S.W. portion of Australia lost two-tenths of an inch between the 8th and 10th, and gained three-tenths during the following twenty-four hours. The monsoonal depression would extend southwards to Wilcannia, and northwards again to Cape York Peninsula.

At 9 a.m on the 13th, the rear portion of a cyclonic storm was shown between Rockhampton and Mackay, where high seas, strong S.E. to easterly winds, and heavy rainfall were recorded. The lowest barometer reading occurred at St. Lawrence, north of Rockhampton, where prior to 9 a.m. it stood at 29·33 inches. Between the 7th and 13th, light to heavy rainfall was recorded over the greater part of Queensland, and light to moderate in South Australia and Tasmania; elsewhere over the continent the distribution was patchy. The largest total reported during this period was 1,192 points at Cooktown. In New South Wales the heaviest totals occurred at Broken Hill with 100 points, followed by Bundella with 82, Bankstown with 81, and Lismore with 79; the remaining amounts were light and scattered.

On the 14th, the weather chart showed an energetic monsoonal disturbance over the eastern states, whilst an extensive high pressure covered the western half of the continent. The centre of the disturbance—which was the remains of the remarkable cyclonic storm responsible for the floods in Central Australia—was situated between Cooktown and Mackay, in Queensland. The chief weather conditions with this distribution of pressure were:—Very heavy rains and high seas on the Queensland coast south from Rockhampton, and strong N.E. to S.E. winds. Light to heavy rainfall was also reported from the New South Wales coast and tablelands. The heaviest falls occurred in the coastal districts of Queensland. Woodford had 1,112 points; Southport, 1,105; Cape Moreton, 900; Ipswich, 748; Tewantin, 660; and Yandina, 650 points. In our state, Tweed Heads had 900 points; Manning Heads, 230; Casino, 224; and Camden Haven, 200.

Within the next forty-eight hours these extreme conditions extended as far southward as our Northern Tablelands, North-west Slopes, and Hunter and Manning Districts, causing remarkably heavy and destructive floods there. The largest rainfalls reported were:—Tenterfield, 900 points; Wee

Waa, 851; Boggabri, 826; Werris Creek, 684: Mogil, 639; Bendemeer and Nundle, 612 each; and Taree, 605 points. Light to heavy rainfall still persisted along the Queensland coast, and here and there along the seaboard of the continent.

By 9 a.m. on the 16th, the anticyclone had gained considerably in energy, for it now had six isobars covering the whole of Australia, with the exception of that portion east from the Great Dividing Range. The centre—30·4 inches—was situated over the south-west quadrant of West Australia, and for the following forty-eight hours controlled fresh to strong south-east to east winds, and fine weather over a great area. On the 18th, however, a depression again appeared over eastern Queensland, and caused some light to heavy rainfall along the coast. Mackay had 401 points, and Mein 155 points. Light falls were also reported from the coastal districts of New South Wales. The centre of the high pressure appeared along our coast line at 9 a.m. on the 19th, having wheeled round from the west to east direction of the previous day. Fine weather resulted over the continent generally, excepting the coast of Queensland, where Mackay registered 193 points.

An antarctic disturbance which appeared between Esperance and the Leeuwin on the 19th was shown a day later over Victoria and Tasmania, having travelled 1,200 miles in the twenty-four hours, or more than double the normal rate. This disturbance caused strong N.W. to S.W. winds, and moderate to rough seas on the seaboard. The distribution of rainfall over the various subdivisions of New South Wales during the week ended the 20th was as follows:—

Western Division	from	40	points at	Gongolgon	to	545	at Mungindi.
North-western Plains	,,	133	,,	Walgett	,,	910	,, Wee Waa.
Central-western Plains	,,	10	,,	Dandaloo	,,	109	,, Quambone.
Riverina	,,	5	,,	Henty & Jerilderie	,,	92	,, Urana.
North-western Slope	,,	46	,,	Manilla	,,	871	,, Boggabri.
Central-western Slope	,,	4	,,	Molong	,,	382	,, Coonabarabran.
South-western Slope	,,	1	,,	Burrowa	,,	49	,, Albury.
Northern Tableland	,,	70	,,	Emmaville	,,	964	,, Tenterfield.
Central Tableland	,,	6	,,	Rockley	,,	354	,, Cassilis.
Southern Tableland	,,	13	,,	Goulburn & Kiandra	,,	28	,, Braidwood.
North Coast	,,	67	,,	Woolgoolga	,,	1419	,, Tweed Heads.
Hunter and Manning	,,	192	,,	Port Stephens	,,	839	,, Camden Haven.
Metropolitan	,,	77	,,	Windsor	,,	159	,, Glebe Point.
South Coast	,,	8	,,	Bodalla	,,	181	,, Wollongong.

The isobaric chart of the 23rd showed that during the preceding forty-eight hours the several pressure systems had travelled eastward at about normal rate, and another antarctic depression occupied a position at about Eucla, in the Great Bight, whilst the centre of an anticyclone was situated over south-eastern Victoria and Tasmania, having replaced the depression of 21st inst. Another anticyclone appeared in West Australia with its centre between Geraldton and Perth. Some good rainfalls occurred over Cape York Peninsula and along the coast as far south as Mackay, otherwise fine weather ruled over the continent generally, excepting the south-west coast, where some light rain was recorded. The heaviest falls were 422 points at Mein, 237 at Cooktown, and 78 at Mackay.

During the next twenty-four hours, rapid movements were experienced in the pressure translation. The high pressure, which was to the south-east, had passed away to the Tasman Sea; the antarctic low, after travelling 800 miles, was now to the south of Portland (Victoria), and the anticyclone over West Australia had expanded 1,200 miles eastward. One hundred and fifty-three points at Mein was the only amount reported from Queensland, and 1 point at Leeuwin, and 15 at Albany were the only rainfalls in West Australia; otherwise, excepting for scattered cloud areas, the weather was fine throughout the continent. Indications of monsoonal activity were apparent on the 25th over Northern and West Australia, where unsettled and showery conditions obtained, resulting for the most part in light rains over West Australia, and moderate to heavy falls along the north coast of Queensland. The heaviest amounts were 820 points at Geraldton, 300 at Mackay, and 40 at Cooktown. Strong west to south-west winds also occurred in the south-east corner of the continent and over Tasmania, with rough seas in Bass' Straits.

During the early morning of the 26th a retrogressive movement took place in the pressure systems over the continent, and an energetic disturbance appeared in the south-east States, with a central barometric value of 29·4 inches in the west of Tasmania. These conditions during the next forty-eight hours resulted in light consistent rain over the southern portion of West Australia, also at scattered places in southern New South Wales and Victoria and Tasmania, where rough seas and very strong winds obtained. On the 28th fine, cool weather ruled over south-eastern districts of our State, particularly on Central and Southern Tablelands. Blayney reported frost in the early morning, and temperatures at Braidwood and Nimitybelle fell as low as 30 degrees and 32 degrees respectively. Warmer conditions, however, occurred in other parts of the State, the highest being 99 degrees at Mungindi, 95 degrees at Grafton, 94 degrees at Casino and Lismore, 93 degrees at Moree and Clarence Heads, 92 degrees at Narrabri, and 90 degrees each at Brewarrina, Cobar, and Bingara.

The low pressure had remained practically stationary during the preceding twenty-four hours, and was still centrally situated to the south-east of Tasmania, where it caused fierce squalls and gales, with high seas. The "high" had lost somewhat in value, and moved in a north-east direction, whilst another low pressure appeared in West Australia, between Geraldton and Perth, and was responsible for some light to moderate rainfall in the south-west districts.

At 9 a.m. on the 30th, this disturbance was shown over the south-east States, its centre occupying about the same position as the one on the 28th, having travelled 1,600 miles in forty-eight hours. The rear isobar of the "high" was also shown over the coastal districts of Queensland. Within the following two days, light rainfall occurred all along the southern coast-line of the continent, and northern parts of our south-west slopes, southern tablelands, coast, and extreme south-west districts.

During the month rather mild temperatures ruled generally over the continent, but a very interesting feature in connection with recent weather was the development and erratic track of the cyclonic storm which, at the

beginning of the present month, was responsible for heavy flood rains in the centre of the continent, and later, after having travelled in a north-easterly direction as far as Northern Queensland in a comparatively enervated condition, recurved southward with renewed vigour through the inland districts of that State as an energetic monsoonal disturbance, and developed again into a storm of cyclonic nature, centrally situated at about Mackay on the central coast. Its growth from incipiency to the vigour it manifested over the latter district may be ascribed to the inducement given by the abnormal weather conditions in Northern Queensland for the production of a storm of this character.

After appearing on the central coast of Queensland, where some heavy rainfall occurred, it extended southward on the 14th, gradually losing its identity as a cyclonic storm as it again merged into the monsoonal disturbance which caused the memorable flood-rains on the Northern Tablelands of our State.

During the month the distribution of rainfall over the various subdivisions of the State was as follows:—

	Departures from normal. Points. Above.		Below.
North Coast	828	to	353
Hunter and Manning	418	to	300
Metropolitan	—		237 to 489
South Coast	—		98 to 639
Northern Tableland	682	to	106
Central Tableland	128	to	756
Southern Tableland	—		104 to 373
North-western Slopes	80 to 625		—
Central-western Slopes	90	to	266
South-western Slopes	—		114 to 267
North-western Plains	684	to	31
Central-western Plains	45	to	218
Riverina	—		45 to 172
Western Division	347	to	158

Comparison with India.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia as far as data are available for the month of March, 1908:—

	Departure from normal. Pressure.	Departure from normal. Temperature.	General Conditions (referring to State as a whole).
	Inches.	Degrees.	
India	+ ·02	− 0·8	Dry.
Sydney (N.S.W.) ...	− ·10	+ 0·4	Wet in north-east quadrant and north-west corner, elsewhere below normal.
Melbourne (Victoria)	− ·13	+ 0·8	Rain above normal in south-west, below elsewhere.
Perth (W.A.) ...	+ ·02	− 2·4	Below normal except on goldfields.
Adelaide (S.A.) ..	− 08	− 2·7	Wet; floods in interior.

The above table shows that, compared with normal, slight excesses have occurred in barometric pressure in both India and Perth, but defects, ranging from ·08 to ·13, at Adelaide, Sydney, and Melbourne.

As regards mean temperature at the above places during the month, India, Perth, and Adelaide were below, and Sydney and Melbourne above normal—the greatest departures having occurred at Perth and Adelaide with 2·4 and 2·7 degrees, respectively, below the average.

Adelaide was the only city which had both elements (pressure and temperature) in defect, and, of the whole five shown in the table, was the only place reporting wet conditions throughout the State.

After-birth in Cows.

JAS. D. STEWART, M.R.C.V.S.,
Chief Inspector of Stock.

In my opinion sufficient attention is not given by dairymen to the "cleaning" of their cows after calving, and the retention of portions of the placenta, or after-birth, is a frequent cause of sterility and abortion in these animals.

Naturally the "after-birth" comes away cleanly of its own accord. Occasionally it is retained for over twelve (12) hours, and in these latter cases it is necessary to adopt treatment. Often the administration of a drench containing the following brings about the desired result:—One ounce ammonia carbonate, twelve ounces sulphate of magnesia (Epsom salts), two ounces common table salt, and one ounce of powdered ginger. Dissolve these in two pints of warm water or ale, and add a cupfull of treacle. When thoroughly mixed the drench is given by the mouth with usual care.

If the "after-birth" remains intact after the drench has operated it is necessary to render assistance by passing the hand and arm, lubricated with carbolised vaseline, into the womb, and exercising gradual traction.

If the whole of the membranes have not been completely removed, and the discharge becomes fœtid in character, the womb should be irrigated in a manner similar to that practised in cases of contagious abortion. To do this all that is required is about one and a half yards of rubber tubing, 1 inch in diameter, and fairly stout; a glass funnel (bottle with bottom knocked out will answer), and a supply of corrosive sublimate in tabloid form. The funnel is attached to one end of the tubing, and the other end, after being lubricated, is gently passed by means of the hand into the mouth of the womb. The corrosive sublimate is dissolved in water in the proportion of one part to 3,000 parts, and then poured into the funnel which is held higher than the animal, so that the fluid passes into the womb. When the womb has been irrigated with a sufficient quantity, usually about a quart, the animal ejects the fluid, and frequently portions of the retained membranes will come away at the same time.

This treatment should be repeated daily until the discharge assumes its natural appearance or ceases. The buttocks and tail should also be washed down with the corrosive sublimate solution, which is a reliable germicide.

Orchard Notes.

W. J. ALLEN.

MAY.

DURING the last week in March the Department of Agriculture received from California a shipment of fruit trees of various kinds, as well as some of the best varieties of walnuts and almonds, many of which will be planted at the Yanco Irrigation Orchard. The importation consisted of varieties of apples, almonds, apricots, cherries, oranges, peaches, plums, pears, and walnuts, the greater number of which arrived in splendid condition, notwithstanding the fact that it was two months since they had left the nursery in California. As it is doubtful whether the apple-trees are worked on blight-proof stock, we do not intend planting them in our orchards, but in an isolated spot where they may be expected to do well. Buds will be taken from them and inserted into older trees which are already established in the orchards, and in this way we will avoid planting any trees in our orchards which are not on blight-proof stocks.

Planting Young Orchards.—Where young orchards are to be planted this season the work of preparing the ground should be pushed on as rapidly as possible; that is, the land should be cleared, well fenced, ploughed, and sub-soiled, and wherever irrigation is to be practised, the land should be graded so as to facilitate the running of the water.

Wherever it is necessary to enclose the orchard with wire-netting, and I am sorry to say that this is a precaution which cannot be overlooked in many parts of the State, it is best to use a good wide netting with small mesh at the bottom, as it is wonderful through what a small mesh a young rabbit will get, as well as how high a fence he will scale; therefore, if the orchardist wishes to preserve his trees from the onslaughts of these pests, he must see that the orchard is securely enclosed.

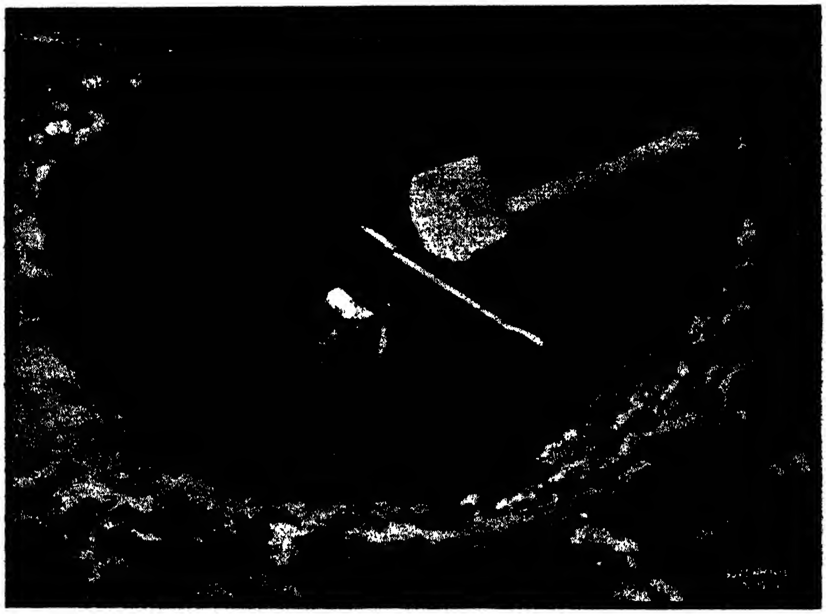
Lay out the orchard properly, giving the trees plenty of room, so that there will be a sufficient area from which they can draw moisture to keep them in good growing condition during dry years.

At time of planting cut all apple and pear trees down to within a foot of the ground, and other fruit trees to within 15 inches. There is nothing like a good low-headed tree which lends itself naturally to the arts of the pruner, sprayer, picker, &c., nor does it suffer so severely as the higher trees from the effects of high winds, the trunks do not sun scald, and it is in every way a most desirable tree to have.

Refilling Old Orchards.—Refills in deciduous orchards should be planted as early as possible.

Citrus Orchards. The orange crops this year are rather poor, but I think the growers who have a little fruit for export might with advantage try the Canadian and American markets, as fruit was commanding very high prices during my visit two seasons ago, and I am told that prices are again good this year; but there would be no use in sending anything there but absolutely clean fruit. Both lemons and oranges are in good demand there during the months of July, August, and September.

Nursery Stock. -The wraps on all budded nursery stock may be removed any time now.



Vine after being cut off, ready to receive the scion.

Choosing Varieties of Fruits to plant.—Ascertain the varieties of fruits which finds most favour in the markets, then select such kinds as will thrive best in your soil and climate. After planting, work, manure, and prune

Appearance of vine after grafts have been inserted.

these in the most up-to-date manner, and when they come into bearing, grade the fruit carefully—pack it neatly—in a word do every part of the work thoroughly, and you will not be disappointed when you make your yearly balance.

Passion Fruit.—Keep the fruit picked up as it falls, as it is then in its best condition; grade it nicely, and pack it in rows in the boxes. If growers are exporting any other fruits, it would be a good plan to send a few cases of passion fruit along in order to test their carrying quality, as if once we can successfully land this fruit on the markets of the Old World, and get it well introduced there, there should be an unlimited market for it, and there are thousands of acres of land near the coast on which this plant does well, and where, with proper attention, it produces heavy crops of fruit annually.

Candied Peel.—Those who intend making any peel should see that it is soaked in the brine for at least four weeks, and that when taken out it is soaked in fresh water for two days, changing the water after the peel has been in it for twenty-four hours. Boil the peel for five minutes, and then place in a syrup of a density of about 14° Beaumé, where it may be allowed to remain seven days, after which it may be immersed in a syrup of a density of 18° to 20° Beaumé, where it may be allowed to remain another week. The density of the syrup may be increased by four degrees for three succeeding immersions, and in the last syrup it may be allowed to remain for as long as three months if desired, as the longer it remains the better it appears to get according to tests which we have carried out.

Garden Notes.

W. SANDERSON.

MAY.

Vegetables.

THE weather for the past few weeks has gradually become cooler, and this season of the year should be availed of for operations in the vegetable and flower garden.

If any new land is being added to the garden, this is a good time to commence getting it in order for subsequent plantings; and if the soil is of a sandy or loamy nature, then by trenching to a depth of, say, 18 inches, at the same time, giving the land a dressing of bone-dust, the result will repay for all trouble or expense; but if the land is heavy, or has a heavy clay subsoil, then subsoiling to the above depth is preferable, which will leave the land well worked; also it is not favourable to the raising or planting out of seedlings, or subsequent cultivation of the land, if it is trodden on or worked when in a wet state, as the surface sets hard and requires much labour to get it broken up again, and this operation has to be repeated after every rainfall.

All rubbish should be cleared up, also useless vegetables, weeds, &c., and piled in a heap, together with any sweepings that accumulate from time to time from the fowl-house, stable, &c., which will directly rot and become useful later on for manuring purposes.

Asparagus.—Perhaps one of the most nutritious vegetables grown is asparagus, and even if only a small plot of land can be spared it is surprising how many dishes may be taken through the season from it. This vegetable thrives in rich sandy or loamy soil, yet it will grow in almost any soil that has been previously trenched or subsoiled and manured, and although it likes plenty of moisture, yet the land should be drained to carry off any surplus water.

If a small bed is to be planted, the soil should be removed to a depth of 5 or 6 inches, and the plants (2-year old if obtainable) set out at about a foot or 15 inches each way, taking care that the roots are carefully spread out and the crown of the plants fully 6 inches below the surface when the soil is returned to the bed.

If an established bed is in the garden, then the tops should be cut off, and a good dressing of well-rotted manure forked in, care being exercised not to destroy the crowns of the plants. If a dressing of salt (coarse) or kainit is made it will also help to improve them.

Cabbage, Cauliflower.—Make a sowing of cabbage seed to keep up the requirements for future transplanting, and plant out from time to time previous seedlings as they become advanced; also, if any strong healthy cauliflower plants are obtainable, a few may be set out in well-manured land.

Peas.—Sow a few rows of this excellent vegetable during the month, giving them some support in the shape of sticks, &c., to climb on when they are about 5 or 6 inches high.

Carrot and Parsnip.—In land that has been previously manured and worked seed may be sown in drills, and when the seedlings appear above ground thin out to about 3 or 4 inches, removing all weeds and cultivating between the rows.

Spinach.—This is a very useful vegetable, as, apart from making a very nice dish, it is easily grown, and does not, as most vegetables do, suffer from aphis. It should be sown in drills about 18 inches apart, thinning out subsequently to 10 inches or a foot in the rows, and if any young plants are coming on from previous sowings they can be planted out as above.

Celery.—Keep up small sowings of seed so that a supply of plants are available when required. Plant out a few strong seedlings in well-manured land in trenches that will retain water or liquid manure when applied. The old method of growing celery, *i.e.*, earthing up to blanch the stalks, seems to be going out of date, growers now preferring to plant self-blanching sorts, which, judging from the amount seen daily in town, must find favour from the general public as being equal in quality to the earthed-up celery, *i.e.*, from a commercial point of view.

Lettuce.—Sow seed in a bed for future planting, but for preference seed should be sown in drills, afterwards thinned out, leaving only the plants that are required. As lettuce requires to be grown quickly, so that they are crisp and tender, oftentimes when transplanting, through unfavourable weather conditions, they receive a check, the result being that the vegetable is not nearly so good as it should be.

Radish.—Make an occasional sowing in rich and well-prepared land, and to ensure them well-grown and tender they must be forced from the start.

Broad Beans.—Broad beans can now be sown, and as they do well in almost any kind of soil there should be no difficulty in producing plenty of this vegetable. The best sort for early planting is Early Longpod (Hangdown).

Kidney or French Beans.—Plant a few rows, about 18 inches apart, and 3 or 4 inches in the rows. In the warmer portions of the State they should produce a crop before the heavy frost sets in.

Parsley.—A small sowing can be made where the plants are to permanently remain, thinning out to a few inches apart. As this seed sometimes takes a fairly long time to germinate, do not disturb the ground too soon.

Onions.—Onions thrive well in a rich loamy soil worked to a depth of about 18 inches, and a sowing of seed may now be made in the warmer

portions of the State. As soon as the seedlings are above ground they should be thinned out to about 6 inches. Also the principal thing in onion-growing is to keep them free from weeds.

If onions are required for pickling, the seed should be sown fairly thick broadcast, and subsequently thinned out to 1 or 2 inches, when they will ripen into small bulbs. For the latter, Silver-skin or Barletta are good varieties to plant, but under any circumstances sow the seed very shallow, as it is not a strong growing seed.

A planting should now be made of garlic, eschalots, potato and tree onions, winter rhubarb, horse-radish, and a few plants of herbs.

Flowers.

Any spring flowering bulbs that have not been planted should be put in without delay, also seedlings or seeds of hardy annuals or perennials as can be procured, such as acroclinium, antirrhinum, aquilegia, calendula, calliopsis, carnation (marguerite), coreopsis, cornflower, daisy, polyanthus, poppy, stocks, pentstemons, and pansy. Among the latter the following sorts should not be overlooked, viz., Jewel, Mammoth, Bugnot's Exhibition and Masterpiece.

A good collection of sweet peas, if planted at once, would make a fine show of bloom in the spring, and they will do well in almost any soil if cultivated and drained, but avoid using too much manure, as it tends to make more leaf and less bloom, which latter should be removed as soon as they are past, for preventing seed-pods forming on the plant encourages it to bloom more freely. Sow in rows or clumps, leaving the permanent plants about 6 inches apart in the rows, or say 6 or 8 in the clumps, about 3 feet apart, giving the plants some support to climb on. For varieties that may be planted now for winter bloom, Earliest of All, or Earliest Sunbeams are the best to put in.

Cuttings of roses, geraniums, pelargoniums, fuchsias, and many other plants, will strike now if shaded after planting, keeping moist, but not too wet. Use sharp sand mixed with a small percentage of loam, taking care to have the pots or boxes well drained.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Dubbo P., A., and H. Association	... F. Weston	... May 6, 7
Hawkesbury District A. Association	... C. S. Guest	... ,, 14, 15, 16
The Central Australian P. and A. Ass., Bourke	... G. W. Tull	... ,, 20, 21
New South Wales Sheep Breeders' Association	.. A. H. Prince	... ,, 24 to 27
Nyngan and District P. and A. Association ...	... R. H. A. Lyne	... ,, 27, 28
Deniliquin P. and A. Society	... L. Harrison	... July 18, 19
Hay P. and A. Association	... G. S. Camden	... ,, 22, 23
Condobolin P. and A. Association	... G. Bennett	... Aug. 4, 5
Narandera P. and A. Association	... W. T. Lynch	... ,, 5, 6
National A. and I. Association of Queensland	... C. A. Arvier	... ,, 10 to 15
Forbes P., A., and H. Association	.. N. A. Read	... ,, 12, 13
Parkes P., A., and H. Association	... G. W. Seaborne	... ,, 19, 20
Murrumbidgee P. and A. Association	... A. F. D. White	... ,, 25, 26, 27
Grenfell P., A., and H. Association	... Geo. Cousins	... Sept. 2, 3
Germanton P. and A. Society	... J. Stewart	... ,, 2, 3
Albury and Border P., A., and H. Society ...	... W. I. Johnson	... ,, 8, 9, 10
Young P. and A. Association	.. G. S. Whiteman	... ,, 8, 9, 10
Cootamundra A., P., H., and I. Association ...	... T. Williams	... ,, 15, 16
Molong P. and A. Association	.. C. E. Archer	... ,, 16
Cowra P., A., and H. Association	... E. A. Field	... ,, 16, 17
Temora P., A., H., and I. Association ..	... John Clark	... ,, 22, 23, 24
Queanbeyan P. and A. Association	... E. O. Hinksman	... Oct. 1
Lismore A. and I. Society	... T. M. Hewitt	... Nov. 11, 12, 13

1909.

Kiama A. Association	... R. R. Somerville	... Jan. 26, 27

[2 Plates.]

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MONTHLY WEATHER REPORT.

HAWKESBURY AGRICULTURAL COLLEGE.

SUMMARY for March, 1908.

Air Pressure (Barometer.)			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	Per cent. of year's Evaporation.
29·63 9	30·33 19	29·98	47·0 29	88·4 31	68·6	69·0	40 28	100 14	75	·265 11	4·713	4·520	10

Rainfall...	Points	65	3½	7	11	9	52	20½	= 168 points.
	Dates	2	6	7	13	14	15	16	

Mean for 16 years = 377 points.

Thunderstorms, 1st and 3rd.

Wind ...	NE	E	SE	S	SW	W
	10	1	6	5	3	2

Greatest daily range of temperature, 36·1° on 31st.

W. MERVYN CARNE,
Observer.

[ADVERTISEMENT.]

Government Stud Bulls available for lease, or for service at State Farms.

Breed.	Name of Bull.	Sire.	Dam	Stationed at—	Lease expires
Shorthorn	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	*
,, ...	Dora's Boy ...	Cornish Boy ...	Lady Dora ..	Berry Stud Farm..	*
,, ...	Royalty ..	Royal Duke II..	Plush ...	Cumbalum ...	17 July, '08.
,, ...	Pansy Duke ...	Earl March ...	Pansy 4th ...	Wollongbar Farm.	*
,, ...	Royal Hampton 10th (imp.).	Soliman ..	Orange Blossom 23rd.	Berry Farm ...	*
Jersey ...	Thessalian II ...	Thessalian ...	Egyptian Princess	Alstonville ...	6 June, '08.
,, ...	Golden Lord ...	Golden King .	Colleen	Wagga Exp. Farm	*
,, ..	Sir Jock ...	Omelette's Pride	Lady Tidy 3rd (imp.).	Berry Farm ..	*
Guernsey ...	Gentle Prince ...	Rose Prince ...	Gentle ...	Ballina	3 July, '08.
,, ...	The Admiral ...	Hawkes Bay ..	Vivid... ..	Wollongbar Farm	*
,, ...	Peter's Lad ..	Peter ...	Souvenir ..	Burringbar ...	
,, ...	Prince Milford..	Rose Prince ..	Flaxy ...	H.A. College, Richmond	*
,, ...	Vivid's Prince...	Rose Prince ..	Vivid ..	Wollongbar Farm.	*
,, ...	Prince Edward..	Rose Prince ..	Vivid ..	Coraki	21 July, '08.
Red Poll ...	The Judge ..	Barrister	Lovely 8th ...	Grafton Farm ...	*
Ayrshire ...	Don Juan ...	General... ...	Judy 9th ...	Bathurst Farm ...	*
,, ...	Royal Prince ..	Curly Prince .	Rosie 5th ...	Grafton Farm ...	†
,,	Auchenbrain ...	Howie's Spicy...	Another ...	Berry Farm ...	*
	Spicy Jock (imp.).	Robin	Mayflower ...		
Kerry... ..	Bratha's Boy ...	Aicme Chin ...	Bratha 4th ..	Glen Innes Farm...	†
Dexter Kerry	Waterville Punch.	....	.. ..	Grafton Farm	*
Holstein ...	The Hague ...	President ...	Lolkje Veeman	H.A. College, Richmond	*
,, ..	Obbe II .	Obbe	La Shrapnel..	Berry Stud Farm..	*

* Available for service only, at the Farm where stationed. † Available for lease, or for service at the Farm.

Regulations under which the Government Stud Bulls are leased.

Department of Mines and Agriculture,
Sydney, 1st July, 1903.

1. Any Agricultural Society, Dairy Farmer, or a combination of Dairy Farmers, may, should the Minister deem it advisable, obtain the hire of one of the Government stud bulls for a period of six months if they guarantee payment for the service of thirty cows, or for shorter periods on special terms.

2. The fee, *which shall be payable in advance*, shall be at the rate of 5s. (five shillings) per cow for all bulls save Dexter-Kerries, and their fee shall be at the rate of 2s. 6d. (two shillings and sixpence) per cow. *Bulls will in no case be forwarded until the fees have been received.*

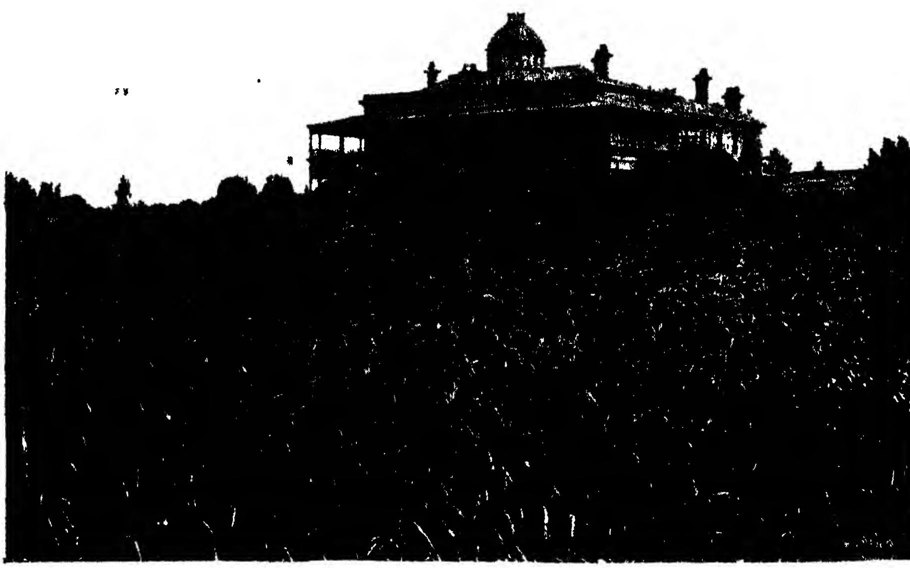
VOL. XIX. PART 6. JUNE 2, 1908.

Agricultural Gazette of New South Wales.

A Private Experiment Station for Grasses

J. H. MAIDEN.

MR. SYLVESTER BROWNE, of Minembah, near Singleton, recently invited Mr. F. G. Chomley and me to inspect his grasses, and our visit took place in March. It will be remembered that this gentleman originally introduced Rhodes Grass (*Chloris Gayana*) into Australia. [See this *Gazette*, December, 1906, p. 1206.]



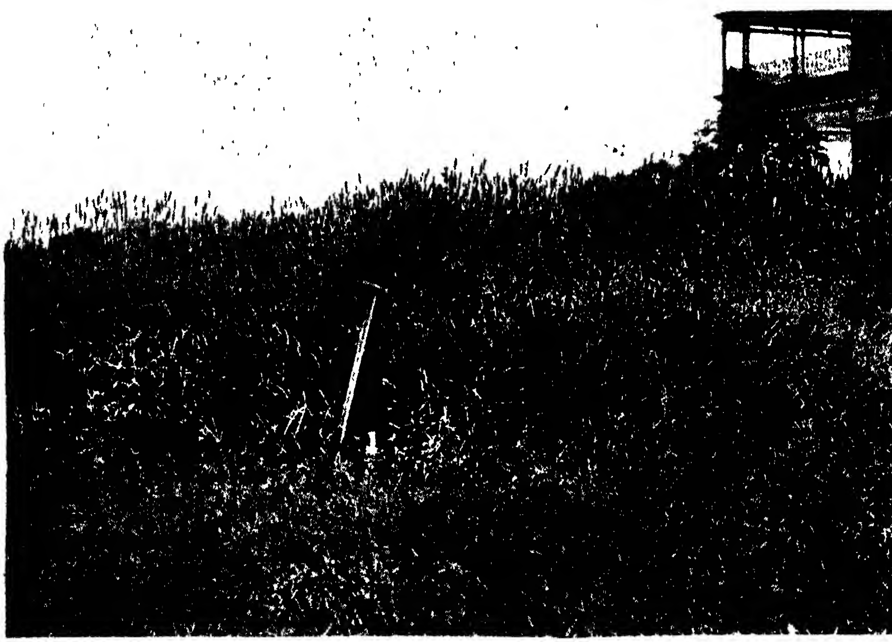
Rhodes Grass (*Chloris Gayana*).

Mr. Browne gives attention both to exotic grasses and native ones, cultivating four exotics in large quantity at the present time, viz.: *Chloris Gayana* (Rhodes Grass), *Chloris virgata* (the Zoet Grass or Sweet Grass of the Transvaal farmers, see the *Gazette* for December, 1906, p. 1207), *Paspalum dilatatum* (Paspalum), and *Tricholæna rosea* (Natal Red Top).

It would be impossible to exaggerate the robustness of growth of these four grasses at Minembah at the time of our visit. They could not grow better anywhere. Rhodes Grass, for example, grows exceptionally up to 6 feet;

acres of it are 5 feet high. When harvested it has an aromatic odour (not oppressive), which is not easy to define; it is pleasant, and reminds one distantly of caramel. Cattle are very fond of it, and of Sweet Grass, green or as hay.

The Natal Red Top Grass bears a profusion of inflorescence of a pink or salmon or orange-pink colour, and with a satiny sheen. When in flower, it is much sought after for bouquets, being one of the most ornamental and graceful of all grasses, and it is as acceptable to stock as it is beautiful. It is drought-resistant, and not at all particular as to soil. Mr. Browne has acres of it about 3 feet high, and the sight of a large area of it, with the setting sun glinting upon it, presents one of the most beautiful sights it is possible to conceive, fit subject for an artist.



Zoet Grass (*Chloris virgata*).

Kentucky Blue Grass (*Poa pratensis*, var.) also does well here, and is a supplementary or winter grass.

Other exotic grasses (but in small quantity) are two of the United States Gramas (*Bouteloua oligostachya* and *racemosa*), while several others are kept under observation.

I fully believe that the wisdom of the old saw about not putting all one's eggs in one basket will be found applicable to grasses. It will be found, sooner or later (and the districts of richest soil and most copious rainfall will find it out later), that grasses supplement each other, and that the productivity of the soil, and the welfare of herbivorous animals can best be

conserved by judicious attention on the part of the grazier to the cultivation of more than one grass.

Turning to the native grasses, I have never in my life seen them in more vigorous growth, and all of them in healthy seed. Many of the species are gregarious—that is to say, it is possible to take patches of many acres in which it would be difficult to find the dominant grass intermixed with even one straggler of any other.

Admitted that this is an exceptional and remarkable season, the thought comes into one's mind, and remains there, that if graziers have a mind to cultivate native grasses, the supply of abundance of good seed need not stand in the way. And while it is wisdom to test and acclimatise the best that other countries have to offer us, the truest wisdom will be to utilise, wherever possible, the already-proved, already-acclimatised, best native grasses of this richly-endowed land. All native grasses are of course not valuable to the pastoralist, but none are useless, although their utility may not always be clear to us. Some of them are but clothing the land, or occupying special situations, fallowing it, if nothing else; and while performing a function not always obvious, that function is always valuable in the grand economy of nature, although we may not be able to transmute the particular grass, under present conditions, into sheep or cattle.

Natal Red Top (*Tricholæna rosea*).
The trees are small Moreton Bay Figs.

Of the native grasses at Minembah, perhaps the most conspicuous and abundant is Blue Grass, of which *Andropogon sericeus* is the commonest species of the genus, although *A. affinis* is also here. There must be hundreds of acres of it here in seed.

Perhaps the Windmill grasses (*Chloris*) come next in abundance, and the large, purplish-brown inflorescence compels attention because of its ornamental character. There are three of them, *truncata*, *ventricosa*, and *acicularis*.

There are various forms of the widely-diffused and variable *Danthonia penicillata*, called Wallaby and Silver Grass. It is very abundant, is drought-resistant, and has high reputation as a sheep grass.

Paspalum (*Paspalum dilatatum*).

Eriochloa punctata, a green grass—that is to say, its inflorescence is not purple or silvery like some of the others—is allied to the Panic Grasses, and it is increasing in favour year by year. It is beginning to be understood more by farmers, who often pass it over, as it is neither showy nor striking. In spite of its liking for damp situations, it will stand a considerable amount of drought, while its nutritious properties are well ascertained. There are two distinct forms at Minembah, one 3 feet high and more, yielding a large bulk of succulent fodder, and a smaller, thinner form, not half the size. There appears to be no botanical difference between them, and at Minembah they grow together, yet each form preserves its individuality.

Of the less important or less abundant grasses at Minembah may be mentioned, *Panicum gracile*, whose seed stalks afford good quail feed; *Panicum effusum*; *Pollinia fulva* and *Sorghum plumosum*, brown-headed grasses: *Eragrostis leptostachya* and *E. Brownii.*

At Minembah I noticed the turkeys greedily feeding on the fruits of *Tribulus terrestris*, a prickly-fruited, sheep-laming, prostrate plant that hitherto I had not ascertained any use for.

Mr. Browne is also extensively cultivating lucerne on the high lands, and obtains most encouraging results; anybody can get good results with it on rich alluvial flats.

This gentleman, whose name will also be remembered as one of the earliest contributors to an exact knowledge of pituri, the Australian aboriginal masticatory, has been interested in the discrimination, cultural possibilities, and fodder value of grasses, whether Australian or exotic, for many years. The consequence is that he possesses a store of ascertained facts in regard to these economic plants which can be possessed by very few private gentlemen, and the willingness with which for years past he has experimented, at my request, on various fodder-plants (chiefly grasses) has placed me under a deep and personal obligation.

Public experiment stations can of course be made of very great utility, but at most they can be placed in very few localities; what we want is to interest private owners to make observations, and to take up experimental work on their holdings, and thus the State will be dotted all over with foci of valuable work.

I cannot conclude these few notes without again drawing attention to the remarkable luxuriance of the seeding grasses on the Middle Hunter in March, 1908; superlatives can alone describe it. This state of the country is the more pleasing because of the comparative severity of the seasons in the district since 1902.

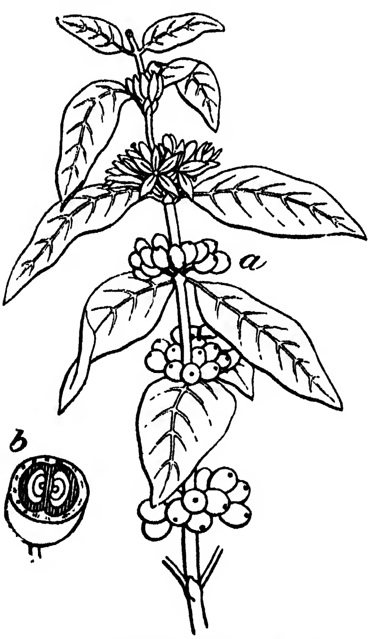
(Photographs by Saunders, Singleton.)

The Cultivation of Coffee.

With Particulars of British and Australian Imports for the Year 1906.

H. V. JACKSON.

THE Commonwealth Government having included Coffee among the items scheduled for bounties under the Bounties Act, it is possible more interest may be taken by some of the New South Wales settlers in the cultivation of coffee than has been the case up to the present, and therefore the following notes may be of service.



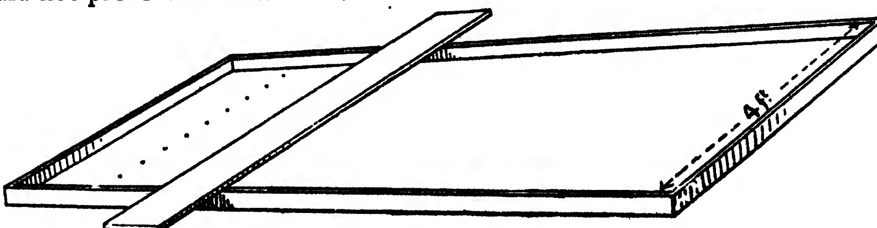
Coffee Branchlet: Fruit, Flowers, and Foliage.
a. Fruit.
b. Section of Fruit.

When the writer was stationed at Wollongbar, Richmond River, some attention was given to the cultivation of coffee trees. The experiment farm was surrounded by the dense scrub and forest growth indigenous to that portion of the country, and although the farm land is undulating and portions are at higher elevations than some parts of the area, nevertheless it was on the whole well sheltered on all sides.

As the extension of settlement caused clearings to be made in the immediate vicinity, care was taken to conserve as far as possible suitable masses of standing scrub on the borders of the farm where windbreaks of standing scrub were most desirable. My predecessor, Mr. G. M. McKeown, had exercised wise discretion in these matters, and I followed the same policy.

During some four years great and rapid changes were perceptible in the landscape through the opening up of neighbouring land for farming, and my observations caused me to come to the conclusion that with the opening up of the surrounding country, and the consequent destruction of the extensive and dense belts of forest growth, it would probably be found in course of time that some tropical plants would prove less satisfactory than they had been in the past, unless care was taken by intending planters to select situations in well sheltered valleys, or, on the higher lands, preserve shelter belts of scrub and forest, or, in the absence of indigenous trees and shrubs, measures were taken to plant suitable quickly-growing trees and shrubs.

Although the farm was naturally well sheltered when coffee trees were first planted, the precaution had been take to plant the trees within the shade and shelter of bananas, plantains, and other suitable shelter, but some experimental plantings of coffee under more open and exposed conditions did not prove a success.

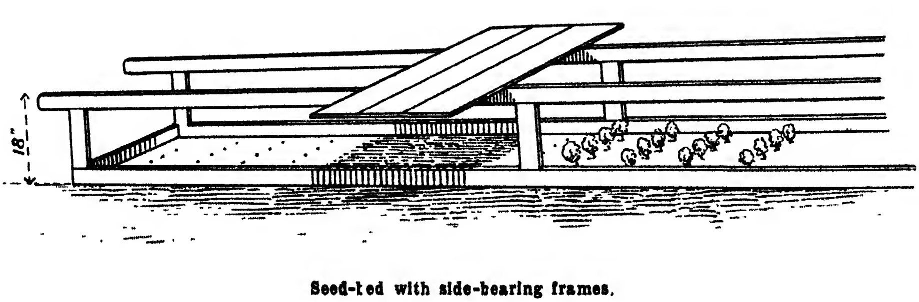


Seed-bed.

As it is in the North Coast district of New South Wales that there is the most likelihood of any attempt being made to grow coffee, the above remarks are made in order to accentuate the fact that the situation must be warm and well sheltered from strong winds.

Deep, rich soil of a free character, and with good natural drainage, should be looked for when selecting a locality for coffee-growing. Soil showing low proportions of phosphoric acid and potash will not yield good crops of coffee.

Coffee plants are raised from seed, sown in carefully-prepared nursery beds, or if only a small number are required they are easily raised in nursery seed-boxes. The seed should be sown a little more than twice its own depth, the incised side downwards. Having placed the seed at the requisite depth, soil should be lightly sprinkled over it, and each row of seed, when completed, evenly pressed with a flat board. The seed should be sown not less than 6 inches apart in rows, and 6 inches between the rows. The seed-bed should be protected with a covering of any light handy material, stretched or laid across the top of the side frames of the seed-bed, which frames should consist of light saplings or sawn wood battens, constructed at a height of about 11 inches.



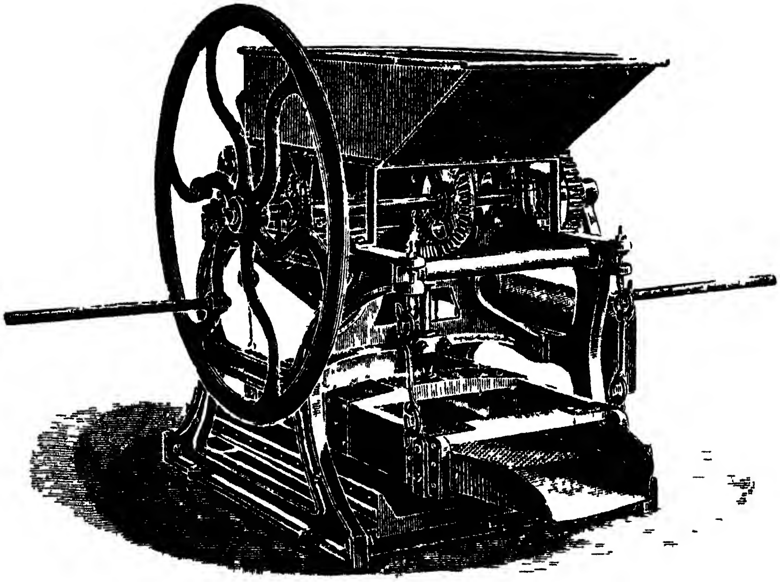
Seed-bed with side-bearing frames.

These coverings are removed in the evening and replaced in the early morning. If the weather is not showery, of course watering at regular intervals will be necessary. During the period of growth the coverings should be removed at suitable intervals, *i.e.*, on dull and showery days, and

the plants gradually exposed to sunshine to harden them off. By the time the plants are 6 or 8 inches high, the shading may be gradually dispensed with.

The more robust of the plants may be removed from the seed-bed and planted out when they are about a foot high, the best time for this operation being when the wet season has commenced.

It is very desirable to avoid windy days for planting, and the roots of the young plants should be carefully covered when they are being carried from the seed-bed to the site of the intended plantation.



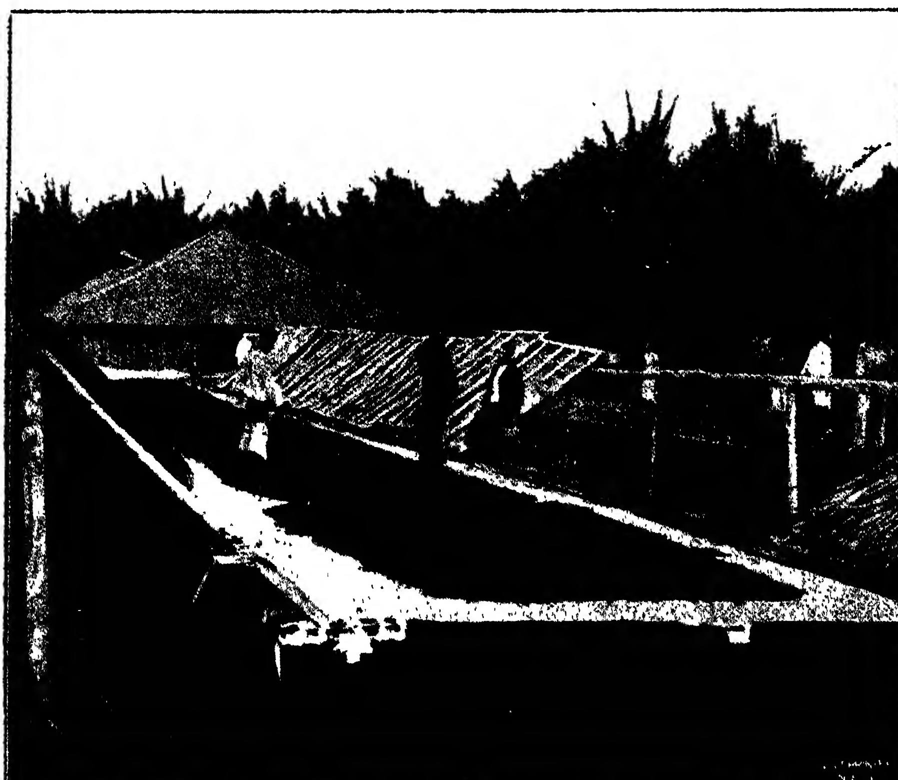
Coffee Pulper.

Coffee trees are laid out much in the same manner as when planting an orchard. In Ceylon 5 ft. x 5 ft. or 5 ft. x 6 ft. and 6 ft. x 6 ft. are the distances adopted ; but 7 ft. x 7 ft., and even 8 ft. x 8 ft. have been recommended for planting in this State.

As the young trees increase in height, the time will arrive when it will become necessary to perform the operation called "topping." This is cutting back the main stem at the height it is intended it shall form the future main trunk. Where manual labour is cheap and plentiful, about 3 ft. from the ground is considered a good average height to cut the shoot, but in this country where the soil will in most cases be cleaned and tilled by means of a horse-cultivator, it is perhaps advisable to provide for the trunk being somewhat higher. The tree should not be cut until the brown bark is showing, for if cut while yet green, it will die back.

As expansion takes place in the growth of the young tree, it will become liable to be swayed by the wind, and the movement of the tree at the foot

causes an opening in the soil. When this takes place, the earth should be replaced; for the purpose of steadying the tree it is a common practice to use a wooden stake. The usual method is to obtain stakes about 3 ft. 6 in. or 4 ft. in length. The stake is driven into the ground in a slanting direction in such a manner that it lies at a slight angle across the tree with the head of the stake facing the point from which the most prevailing wind blows. The stake and tree are tied with raffia or other suitable fibre, or piece of rag, admitting of a little play so that the wooden stick does not score, *i.e.*, wear into the bark of the tree.



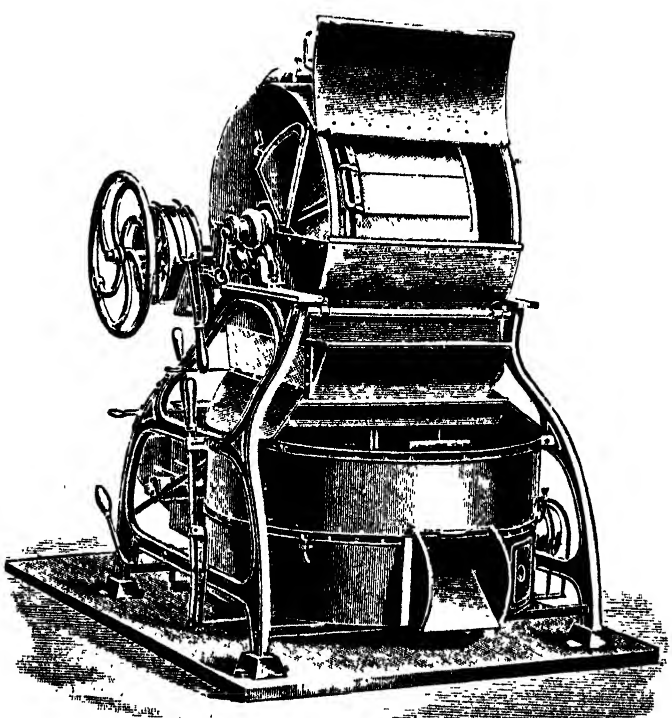
Drying Coffee in the Straits Settlements.

In due course judicious pruning will be necessary. Suckers may have grown from the bottom, and they will require to be removed. Dead or useless growth also should be cut away. The centre of the tree may be opened out by thinning, and cross branches cut out. The long branches, "primaries," require handling, *i.e*, removing too numerous "secondaries," leaving only one or two "secondaries" along the branch at each point where several will be met with, care being taken to leave those which are growing in proper directions. Through proper attention in the early stages the work of pruning later will be an easy matter.

The young coffee tree is very exuberant in throwing out large quantities of undesirable shoots, which, if allowed to mature, necessitates a free use of the pruning knife later on. There are some coffee planters who are not in favour of much pruning until the first or maiden crop has been obtained.

In the *Agricultural Gazette* of January, 1891, there is an excellent article on Coffee Arabica by Mr. Fred. Turner, F.C.S, and on the subject of pruning he says:—

This is a very important operation; for on this not only depends the health and longevity of the shrubs but the facility for gathering of the crop. Each shrub should be trained to one stem, and if any of the lateral growths are likely to throw it out of balance, they should be kept pinched in, and the superfluous shoots cut out. When the plants have attained a height of 5 feet the leaders should be cut out, and the shrubs never allowed to grow any higher. The plants will then grow laterally, and after a few years of good cultivation, will nearly meet each other. The centre of the shrub should be kept perfectly clear of upright growth so that plenty of air can circulate amongst the branches. Neglect in this particular will cause much dead wood to accumulate to the detriment of the trees. I have found out by experience that, if the shrubs are carefully gone over with a sharp knife, after the crop is gathered, for the purpose of cutting out superfluous growths, and then again during the early part of the year for the purpose of taking out the water-shoots that grow in the centre of the plants, no further attention will be required in the way of pruning. A well-grown coffee shrub should present a dome appearance.



Coffee Roaster.

In 1898 a Grafton newspaper reported that Mr. Henry Bassman, of Emigrant Creek had about fifty coffee trees, five years old, in full bearing; they were planted 7 feet apart, and the branches of the trees were touching, and

Mr. Bassman favoured wide planting, *i.e.*, up to 12 or 16 feet. Mr. C. Skelton, who had been making inspections and reporting to the Department of Agriculture on coffee-growing, commented as follows on the views of Mr. Bassman:—

Mr. Bassman contends that the distance I gave in a former number of the *Gazette*, namely, 6 ft. x 6 ft., commonly adopted by planters in Southern India and Ceylon, is too close for the rich soil of the northern river districts of this Colony. His trees, he states, though planted 7 feet apart, are now, at 5 years of age, touching each other and the branches interweaving, which I can quite believe; but at the same time, to plant the trees from 12 to 16 feet apart would simply be wasting ground. The primary object in planting coffee, it is assumed, is to get the most out of it in the way of crops that you possibly can. To this end, careful hand-pruning after the plant has obtained a height at which it may be topped is necessary, and after the second crop knife-pruning must be resorted to. If the tree is allowed to go on growing as in its natural state, the planter will find that after the fourth or fifth crop the returns from his trees will year by year become smaller and smaller and beautifully less, for the simple reason that the whole energy of the plant is expended in maintaining a quantity of useless old wood; the tree will become an impenetrable conglomerate mass of long whippy branches, with only a foot or so at the tip of each capable of bearing fruit. When the tree is topped, at a height to be determined by nature of soil and aspect,—usually from 4 to 5 feet, if much exposed, top low—it will endeavour to continue its upward growth by throwing out suckers just under the top pair of primaries. These must be removed by hand, never cut, as also any secondaries that may spring out within 6 or 8 inches of the stem, so as to have a clear space in the centre to allow the sun to penetrate. Should two secondary branches be found springing from one eye, remove one. This is called "handling," and has to be resorted to every three or four months, or even oftener, according to the wood-making capabilities of the plants. As soon as the second crop has been gathered, that is, in the fourth year, pruning with the knife must commence. This consists of cutting off the secondaries that have borne crop. Be careful not to cut too close so as to injure the eye, for out of this eye a secondary must spring to bear next season's crop. If a primary branch seems too long, and inclined to interfere with the adjoining trees, cut it back to the first good secondary at, say, 2½ or 3 feet from the stem, and let it take the lead Three pairs of secondaries on each primary are quite sufficient to bear a very heavy crop —at least 3 or 4 lb. of dried coffee to each tree. By restricting the wood-bearing propensities of your trees in this way, you make the most of them, and it will be seen that no such great space as suggested by Mr. Bassman is required. Seven to 8 feet apart, or sufficient to admit of a cultivator being driven between the trees, would, in my opinion, be ample. It must not be forgotten that a foot either way makes a vast difference in the number of trees to the acre, and consequently in the returns of crop.

In Ceylon and Sumatra various trees are spoken of as suitable for shade purposes in coffee plantations, and it is suggested the shade trees should be planted some while before the coffee; it is contended the shade tree is easily removed if not required, but if the coffee trees are suffering through want of shade it takes some time to provide it.

In Sumatra, *Erythrina indica*, and *E. Albizzia* species are spoken of for shade trees, and in Ceylon *Grevillia robusta* has, I believe, been tried for the same purpose.

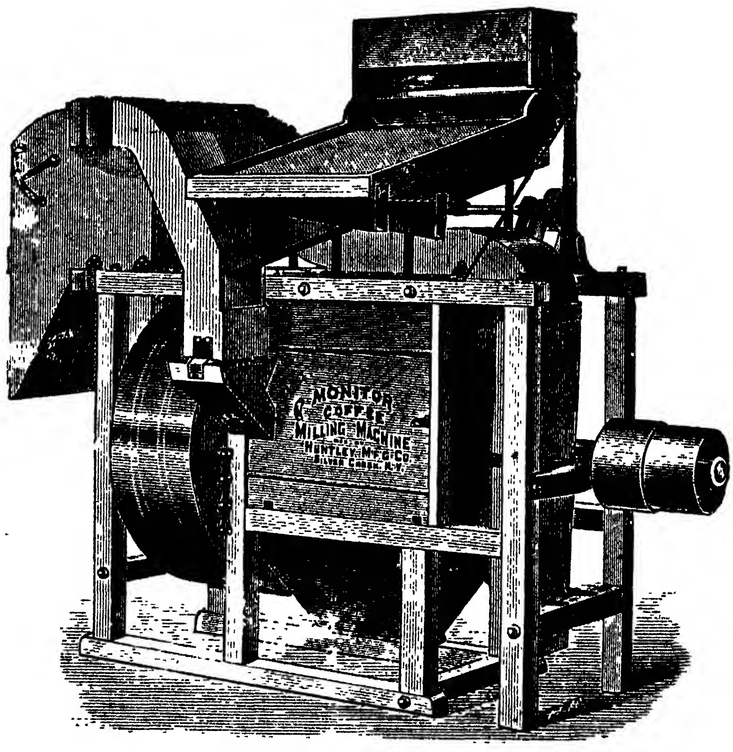
The coffee-tree begins to come out into full bearing in the third year. The fruit, resembling a cherry, has an outer covering named the "pulp," inside of which are two beans. The beans are enveloped in two coverings, the outer called the "parchment," the inner thin covering the "silver skin."

The first operation dealing with the gathered fruit is that of passing it through a pulper. From the pulper the beans pass into a cistern, where they remain for fermentation. After one or two days, according to circumstances, the fermented coffee beans are passed into washing cisterns, where the gumming substance adhering to the beans is washed away. When thoroughly washed, the coffee is spread out on a prepared level space or on trays for

drying, preparatory to being despatched to the nearest port of shipment, where it may be put through a further process of peeling, sizing, and packing before being shipped.

With regard to yields obtained by Indian coffee-planters, it has been estimated that 100 acres in the third year yield a maiden crop ranging up to 20 tons, and good crops in the third and fourth years up to 40 tons.

It has been reported that in 1903, 394 acres were under cultivation in Queensland, of which 318 acres were bearing, the yield being 83,652 lb., and at Herberton 615 lb. per acre were obtained.



Coffee Milling Machine.

The importations of coffee and chicory into the United Kingdom during 1906 were as follow :—

Coffee (including roasted and ground) :—

	cwt.	£
From Germany	36,835	109,645
,, France	53,724	118,385
,, Central America	144,786	351,674
,, Brazil	132,377	251,498
,, Other countries	224,558	65[illegible],852
,, Ceylon	2,786	9,845
,, Other British possessions	174,041	536,888
	769,107	£2,033,787
Entered for Home consumption...	262,578	

Importation of chicory, value £36,828.

Australian importation of coffee and chicory, 1906 :—

		lb.	£
From	United Kingdom	475,324	21,983
,,	Aden	50,359	1,854
,,	Ceylon	331,129	9,120
,,	India	488,208	13,538
,,	New Zealand	32,400	771
,,	Other British possessions..	80,986	2,178
,,	Arabia	1,759	68
,,	Germany	5,862	215
,,	Hawaiian Islands... ...	23,296	740
,,	Java	234,392	5,621
,,	New Hebrides	35,652	659
,,	United States	263,542	7,433
,,	Other foreign countries ...	14,555	458
		2,037,464	£64,638

In the *Public Ledger*, London, 30th November, 1907, the following are the market quotations for coffee :—

Coffee, in Bond (duty, 14s. per cwt.).

	per cwt.		per cwt.
Jamaica—		Nyassaland—	
Coloury	75s. to 124s.	Low middling to good middling	50s. to 57s.
Greenish	50s. to 65s.	Good to fine	58s. to 64s.
Fine ordinary... ...	45s. to 48s.	Costa Rica—	
Good to fine ordinary	38s. to 44s.	Good to fine middling	57s. to 63s.
Ceylon—		Ordinary to low middling	44s. to 56s.
Plantation, fine ...	120s. to 124s.	Guatemala—	
Fine middling ...	114s. to 116s.	Foxy	38s. to 42s. 6d.
Good middling ..	110s. to 112s.	Good ordinary to low middling	44s. to 52s.
Middling	105s. to 109s.	Middling	54s. to 57s.
Low middling .	95s. to 100s.	Good middling to fine	59s. to 73s. 6d
Small	60s. to 78s.	Nicaragua—Foxy ...	38s. 6d. to 42s. 6d.
Pea-berry	75s. to 115s.	Colombian—	
East India—		Ordinary	37s. to 39s.
Superior	100s. to 106s.	Good ordinary to low middling	40s. to 52s.
Good to fine	80s. to 95s.	Middling to fine ...	53s. to 71s.
Middling to good middling	60s. to 75s.	Vera Paz—	
Fine ordinary to low middling	50s. to 58s.	Gray	50s. to 72s. 6d.
Mocha—		Good to fine	75s. to 113s.
Long berry	75s. to 85s.		
Short berry	90s. to 110s.		

Wheat-growing in New South Wales.

[Continued from page 366.]

G. L. SUTTON,
Cowra Experiment Farm.

From Farm to Market.

Some farmers draw their own wheat from the farm to the nearest mill or railway station, but the majority have their produce carted in by regular teams, who do this work at reasonable rates, which range up to 1s. per bag for a distance of 20 miles.

No difficulty is experienced in selling the grain after it is bagged. Grain merchants and millers are anxious for it, and compete to secure it at prices which are governed by those ruling in Mark Lane, London. The local value is from 1s. 1d. to 1s. 3d. below that ruling in London. On the London market Australian wheat is generally worth 6d. per bushel more than British wheat.

The farm horses are usually fed on wheaten hay cut into chaff and mixed with cracked or pinched wheat. A certain percentage of the wheat harvested is cracked or pinched, and during the operation of winnowing is separated from the marketable grain; this is retained by the farmer for horse and poultry feed.

The wheaten hay is made by cutting the crop just after flowering, with the reaper and binder. The sheaves are then stooked in the paddock for ten or fourteen days, until dry enough to be carted in and stacked. The climate renders hay-making exceedingly easy, and tends to produce a bright-coloured nutritious hay. The average yield is from 20 to 22 cwt. of cured hay per acre. The reaper and binder is drawn by three horses, and requires one driver, who on an average cuts 10 to 12 acres per day. In light crops it requires one man to stook after the machine; in crops yielding from 1½ to 2 tons per acre two men are required. Very few farmers cut their own hay into chaff; this is done by contractors, who have a travelling plant, comprising a steam-engine, chaff-cutter and bagger, and who go from place to place and cut up the hay into chaff and bag it, charging 9s. per ton.

Assigning market prices to the material used, the cost of feeding farm horses amounts to about 16d. per day.

The Day's Work.

In the ploughing season, work commences at 7.30 a.m. and continues until about 5.30 p.m., with a break of about two hours in the middle of the day for dinner. At harvesting or stripping time, work generally

commences about 8.30 a.m. (for during the night the wheat becomes toughened, and does not thrash well until the sun is well up) and continues till 7 or 7.30 p.m., with the same break in the middle of the day and two intervals, one in the morning and one in the afternoon, of twenty minutes each for rest and refreshment. During ploughing time the driver is required to take care of his own horses, but at harvest time his horses are fed, groomed, and harnessed for him, so that the most can be made of his services, the machines kept employed, and the harvest completed as rapidly as possible.

Though the bulk of the wheat is raised by settlers who work their own farms, with perhaps just a little help at specially busy times, quite a large amount is now grown on large estates, where the most modern and effective implements and machinery for producing this crop are to be found.

The wages paid are:—Ploughmen £1 per week and board and lodging, harvest hands—machine-men 7s. to 8s. per day, bag-sewers 6s. to 7s. per day, and board and lodging.

Cost of Production.

The following figures give the exact cost of production during two years on one of those large farms in a district with less than 20 inches average annual rainfall. They serve to show how cheaply large areas can be worked:—

WHEAT.

ACTUAL COST OF PRODUCTION IN 1904 AND 1905.

1904—Area planted, 1,914 acres.
1905— „ „ 1,339 „

Putting in Crop.

	1904.			1905.		
	£	s.	d.	£	s.	d.
Wages	104	16	6	119	12	4
Rations	14	10	4	25	11	10
Hut accommodation	14	0	4	......		
Ration sheep	35	13	6	30	15	0
Superphosphate	71	6	3	120	0	0
Oil, rims, brushes, plough-shares, &c.	10	17	11	15	11	6
Duplicates and repairs	12	1	2	9	7	7
Forage	93	19	3	102	17	4
Contracts—Ploughing, sowing, harrowing ...	515	3	6	328	0	0
Seed-wheat	144	14	9	137	9	2
Bluestone	1	12	8	3	13	10
	£1,018	16	2	£892	18	

Cost of putting in crop per acre—	s.	d.
In 1904	10	7¾
In 1905	13	4

Harvesting and Carting.

	1904.			1905.		
	£	s.	d.	£	s.	d.
Wages ...	184	17	8	135	12	9
Rations ...	27	17	9	14	9	6
Ration sheep ...	31	18	9	23	10	0
Contracts—Harvesting ...	357	13	0	172	4	10
Storage on wheat ...	47	15	3	......		
Oil, twine, &c. ...	20	8	8	14	7	11
Duplicates, repairs ...	58	6	7	18	1	3
Forage ...	59	10	4	74	9	6
Cornsacks (station) ...	139	18	0	120	4	7
Insurance ...	57	13	1	28	12	7
	£985	19	1	£601	12	11

Cost of harvesting crop per acre—	s.	d.
In 1904 ...	10	3½
In 1905 ...	8	11¾

Total cost per acre.

1904.	£	s.	d.	1905.	£	s.	d.
Putting in ...	0	10	7¾	Putting in ...	0	13	4
Harvesting ...	0	10	3½	Harvesting ...	0	8	11¾
Total ...	£1	0	11¼	Total ...	£1	2	3¾

YIELDS.

	£	s.	d.
1904—1,914 acres, 12 bushels, at 3s. ...	1	16	0
Less cost of production ...	1	0	11¼
Profit per acre ...	£0	15	0¾

	£	s.	d.
Net return from 1,914 acres ...	1,441	9	7½

	£	s.	d.
1905—1,339 acres, 10 bushels, at 3s. ...	1	10	0
Less cost of production ...	1	2	3¾
Profit per acre ...	£0	7	8¼

	£	s.	d.
Net return from 1,339 acres ...	513	5	8

These may be regarded as practically minimum yields on large farms in ordinary seasons, and by no means indicate the possible yields on smaller, well-worked farms in similar seasons. They show a reasonably remunerative return from land valued at about £3 per acre, even when the whole of the work is done by contract or by hired labour. The "prizes" of wheat-growing go, however, to farmers who manage and assist to work their own farms, especially when such are farmed on up-to-date lines, and in conjunction with sheep and other live stock.

Share-farming.

A considerable number of farms, and particularly the large ones, are worked on what is known as the "shares" system.

Under this system a farmer possessing the necessary team and implements arranges with the land-holder to crop a certain area for a season, or for a number of seasons. The usual form of agreement provides that the landowner shall provide land, seed, two-thirds of the manure (where manure is used), and bags for his share; the farmer on his part must perform all the operations of cultivation and harvesting in a workman-like manner, and at seasonable times, using his own plant for the purpose; he must also provide one-third of the manure (where manure is used), and bags for his share. Up to a specified yield of the crop, the owner and farmer take equal shares; any excess becomes the property of the farmer, as a bonus to encourage good and thorough farming. Special arrangements are often made to suit local conditions. This method of working large areas is invariably a success where the arrangement is drawn up on a truly co-operative basis, and is one of the most satisfactory ways of working large estates. At "Iandra," the birth-place of this system in New South Wales, some 18,000 acres are planted on the shares system. Share-farming is admittedly not so desirable a condition as that in which every man farms his own land, but such a system is one by which large properties can be successfully handled, and one by which a man who has no land of his own may accumulate enough means to buy some. That it has done this is proved by the cases of farmers who now have comfortable properties of their own, but who commenced as share-farmers. To reputable, suitable men, without capital or plant, some landowners have advanced sufficient capital to enable the men to buy plant and make a start. In some cases the owner places a price on the land, and gives the share-farmer the option of purchasing his area at that price after five years.

Cost of Implements.

Labour-saving machinery is necessary to the wheat-grower, and he is fully alive to this fact. The machinery merchants assist the man with small capital to acquire this by supplying implements and machines on easy terms, the payments being spread over two or three seasons, and falling due after harvest time. For the accommodation provided, a reasonable rate of interest is charged. The cash prices in Sydney for some of the various implements, &c., used on a farm are:—

Ploughs—

- Mould-board, ordinary, 2-furrow, £10.
- Mould-board, ordinary, 4-furrow, £18.
- Mould-board, stump-jump, 2-furrow, £22.
- Mould-board, stump-jump, 4-furrow, £32.
- Disc, ordinary, 4-furrow, £26.
- Disc, stump-jump, 4-furrow, £38.

Peg-tooth harrows, six sections 20 feet wide, £8.
Disc harrows, 8 feet wide, £18 5s.
Spring-tooth cultivator, £22.
Spring-tooth cultivator, with seeding attachment, £24.
Drill—
13-hoe, £34; 13-disc, £36.
15-hoe, £37; 15-disc, £39.
Reaper and Binder, £38.
Stripper, £45 to £50.
Winnower, £25.
Harvester, £75.
Tip-dray (one-horse), £18.
Spring-van, £20.
Waggon (six or eight horse), £70 to £80.

The freight on agricultural machinery is 13s. 4d. per ton for 100 miles, £1 12s. 11d. for 200 miles, and £2 4s. 4d. for 300 miles.

Classes of Wheats Grown.

Australian wheat, like Australian wool, has characteristics of its own. British millers prize it, because of the large amount of flour it produces, and because it gives colour and bloom to their product. At present it is somewhat deficient in "strength," and to supply this deficiency, British millers mix or blend it with Manitoba varieties; the two wheats combined produce a flour with both "strength" and "bloom."

The character of Australian wheat is, however, undergoing a change, and its strength is being improved by the introduction into general cultivation of the new wheats which the Department of Agriculture has produced by cross-breeding. Some years ago the Department commenced the work of wheat improvement with the object of breeding new wheats which would be stronger, more disease-resistant, and generally more suitable for Australian conditions than those at that time in general cultivation. Tangible results show that this work has been a success, both from a farmer's and from a miller's standpoint. The area planted with the new varieties increases each year. In 1906, in one district alone over 10,000 acres were planted with one of the new varieties which had been introduced three years previously. The effect of these new wheats on the quality of the locally-milled flour is already being felt; its strength has appreciably improved. Another result of this work is that the importation of the strong Manitoba varieties, formerly purchased to blend with the local wheats, has practically ceased.

The new wheats as they are produced, are distributed to the farmers who are anxious to try them on their farms, to determine their suitability or otherwise for their particular districts. Enough of this work has already been done and sufficient evidence obtained to predict with confidence that in the future Australian wheats will be desired, not only because they yield well and for their ability to produce a large quantity

of flour of excellent colour and bloom, but also because without blending with other wheats they will yield a "strong" flour, and one from which bakers will be able to make a large, well-risen, nutritious loaf, of good colour.

What the Future has in Store.

The prospects of the wheat-growing industry are exceedingly bright. It is capable of very wide expansion. Within what is known to be the area in which wheat-growing can be carried on with safety, a great proportion of the immense areas now devoted to pastoral purposes consists of land which could be profitably utilised for agriculture, much of it being more suitable for wheat than that already devoted to its cultivation. In this "safe" area, it is estimated that there are between 20,000,000 and 25,000,000 acres suitable for wheat-growing, and less than 2,500,000 acres are now under this crop. In addition to the "safe" area, the experimental work done by the Department of Agriculture plainly indicates that new methods and new varieties will render wheat-growing possible and profitable in districts now considered to be too dry for it, thus adding considerably to the area available for the cultivation of wheat.

The Government, recognising that in many districts any large increase in area under crop can only be brought about through close settlement and the construction of light lines of railways, are pursuing a vigorous closer settlement policy. New lines of railway to tap the districts containing arable land are being constructed, and other lines are being considered.

There is conclusive evidence that wheat-growing has proved and is still proving highly remunerative to those engaged in it, and as the naturally rough-and-ready methods of the pioneers give place to better and more advanced ones, it is not unreasonable to expect that it will prove still more profitable. The early settlers started with little or no capital, little practical knowledge, and no experience to guide them; now there is the experience of a century to guide the present farmers, and, in addition, the work of the Agricultural Department is yearly adding to the information already obtained regarding the most suitable and profitable methods of cultivation. A branch of it is also breeding new wheats especially suitable for Australian conditions and methods.

With a plentiful supply of suitable land still available, with more accurate information relating to the principles underlying wheat cultivation, with better methods of cultivation and handling, with better wheats, there must be and there are immense future possibilities before the wheat-growing industry in New South Wales.

Hawkesbury Agricultural College and Experiment Farm

Report of the Sixth Annual Egg-Laying Competition for Pullets, and First Two-year Contest for Hens—1st April, 1907, to 31st March, 1908.

D. S. THOMPSON,
Poultry Expert, Hawkesbury Agricultural College.

Types, Breeds, and Strains.

While the chief object of the promoters was undoubtedly to stimulate systematic breeding for egg production, there is no doubt that many lessons have been demonstrated, which are of great value to the egg producer. Not the least of these have been the plain data evolved in regard to first breed and then strains of breeds, and also of different types.

No. 1. First Pen Langshans. J. R. Wakler.

The great object ever before the organisers, the conductor, and the committee has been how to get a larger number of eggs from one hen in the shortest time and at the least expense. The question of housing and feeding having been rather exhaustively discussed in previous articles, we intend to deal with the very important question of types, breeds, and strains which a long acquaintance with breeding and the extraordinary chance of conducting these egg-laying competitions has given us.

It has been said that there is no difference in the egg-laying capacity of breeds but only of strains. To this a distinct denial must be made. For instance, a Game fowl has no conformity to egg-laying, and could never be brought up by the most scientific selection to the capacity of an Italian Leghorn, whose conformity is naturally adapted to prolific egg production.

So, just in a less or greater degree, it is the same with all breeds. It is just a question of how far show fads have been followed and how much general utility has been bred for, and the breeds that have had the greatest number of show fads are those which have deteriorated the most in this respect. Some people say there have been no fads; well, let us investigate.

Black Spanish.

They were practically the first known European fowl; unalloyed, they were splendid layers, and it is very questionable whether, with all our skill in selection, we have improved on this grand old original breed in precocity. Fifty years ago it was recognised as a fowl of splendid stamina, very high vitality and vigour, and a first-class layer of very large eggs. Then the showmen took them up; and for something hard to breed and hard to get, they set themselves the task of producing a black fowl with white legs. Then the Spanish for a time were practically lost; but being rediscovered, with the original slaty colour leg, they were bred again and became popular. Having red faces, however, some fancier discovered that by a system of breeding in and in, the white earlobe increased in size, and now the Spanish is lost in oblivion

No. 2. Langshan. J. R. Wakler.

Cochins.

Cochins were never built for prolific egg production, but they were bred for profuse feather until they became simply large balls of fluff, and then were practically lost

Brahmas.

These were of a different conformity to Cochins; and could lay more eggs and thrive on less food. Originally they were first-class layers, particularly in the winter time, and were also splendid table birds; but like their Cochin friends they were lost in feather and fluff, and have now practically disappeared.

British Games.

British Games, although never first-class layers, still laid satisfactorily in the olden days, were very hardy and great foragers, grew fairly fast, and were excellent for the table. Then in the hands of the fancier they were improved out of existence by being put on stilts. A 26 inch coop was not high enough for them to stand up in.

Minorcas.

Minorcas were taken up originally under that name, although they were really the original Spanish. Fifteen years ago they were bred for excessive comb, until it was as large as a pound of steak, and then a revulsion of feeling set in, and to rapidly breed out the abnormal comb, Langshan blood was introduced and the Giant Minorca formed. This made a really handsome bird; but the breed has never regained its former egg capacity of half a century ago. The blood inserted in the Minorca was not the true Langshan, but the modern Langshan, which is contaminated with Black Game. It has brilliant sheen, hard short feather, scant leg-feathering, making a handsome bird to look at, but with a facility for laying far behind its true ancestor.

No 3. White Leghorns. S. Ellis.

Langshans.

Langshans were ruined through breeding for size, reach, Game type, and close feather, and now they are being neglected, and the original type has already taken their place for utility, and also, to a certain extent for show in England, although the modern bird is still shown. With the advent of Wakfer's Langshans in the egg-laying competition came the eye opener as to the egg capacity in strains of breeds. The old strains, away from the Game modern type, still inherited a great precocity, as instanced by the laying of Ponton's Langshans, which were right away from the Game type, and not too big, and laid nearly 1,200 eggs in the second competition. This, however, was Ponton's best year, and instead of increasing in egg-production, they increased considerably in size, and the consequence was a reduced output, until, in 1908, they had to be discarded in the forty pens for the second-year test. Truly a lesson in breeding the wrong way for eggs. The discovery of Wakfer's strain is of great importance to Australia. They are moderate eaters, very small compared with the coarse Langshan, and will lay a much

larger percentage of eggs of equally as large a size, will mature faster, and lay sooner in the autumn. Referring to Illustration No. 1, the birds shown laid over 2,400 eggs in twenty-four months, without the replacement of a hen, showing wonderful stamina and vitality besides precocity. It may be interesting to state that these celebrated layers do not test first-class under the Hogan system, but they are undoubtedly of first-class general conformity for egg-production. They are not all exactly of one type so far as stature is concerned ; the one shown in Illustration No. 2 is of medium height, while others are medium low, showing the tip given to the fancier, how the size and reach could easily be increased, to the draught-horse type, which is shown in Illustration No. 28. This monster weighed 10 lb., but might have weighed 20 lb. from the size of her frame. Mr. Wakfer says of his Langshans : "For several years, while employed on the E and A. line of steamships, I made it a practice to bring to Sydney occasionally a few Langshan fowls for use in my home, and have never until quite recently tried any other breed. I always purchased my birds from a sampan in which poultry is hawked around to the ships on the river at Shanghai, and the Chinaman who supplied me said that he bought the birds in Langshan. The pullets at present in the competition were picked out from my pens in a haphazard sort of way the day previous to being sent away, and are the descendants of hens I purchased in China four years ago. Two years ago I tried, as usual, to procure a fresh stock of birds at Shanghai, but could only obtain very poor specimens, and was informed that the reason of the scarcity was that the Indian troops sent to China during the Boxer disturbance had, on returning, bought up all the Langshans procurable, to take to their homes in India. I have always found them splendid layers, both in winter and summer, and they are very hardy. During winter—in fact for many months—forty hens, two years old, averaged a weekly profit of 20s. That they are hardy is due to the climate of North China, severe cold and deep snows in winter and intense heat in summer. The chickens certainly feather slowly, or they have done so with me, but they are very hardy. Last season I hatched out about 400 Langshans and their crosses, and the same number of other breeds that I intended trying, and the Langshans proved the hardiest."

No. 4. White Leghorn. S. Ellis.

White Leghorns.

White Leghorns are, no doubt, an albino sport from the original Black Spanish, and bred to a different conformity of type by the Italians.

Their whole structure and temperament denote the greatest precocity, and no doubt the breed can eclipse anything and everything in egg production in number, under modern conditions of poultry farming. Unalloyed in Italy, they are active, hardy, sprightly fowls of great laying capacity. In their country of first adoption, viz., America, they suffer through want of stamina in confinement through the insertion of Hamburgh blood. In England they have been crossed with the modern Minorca to obtain purity of colour, or snow white, and while they have been much

No. 5. White Leghorns. G. H. Arkinstall.

increased in size, it has been at the expense of egg production. Here in Australia, by an infusion of the American and English strains a medium bird has been bred which eclipses both in the matter of sustained egg production in confinement.

In Illustration No. 3 will be found a medium type inclined towards the English, and more of the old-fashioned type of America before the crossing with the Hamburgh took place.

Illustrations Nos. 29 and 30 are both single specimens of a quarter of a century ago, and are splendid types of laying breeds with a good body.

Illustration No. 6 is a good type of the real American layer, and shows the Hamburgh character in lines and gait and also in temperament.

They inherit the intense precocity of the Hamburgh, but with that the very nervous system which resents confinement and from which the stamina suffers.

No. 6. White Leghorn. G. H. Arkinstall

Illustration No. 10 gives a single specimen of the winning pen, and this shows a fine specimen of the Australian type. Medium size, with less Hamburgh blood, their nervous system is not so highly strung, and they take better to confinement, or the conditions necessary under profitable poultry farming. The

No 7. White Leghorns. A. D. Craig.

No. 8. White Leghorn. A. D. Craig.

poultry breeders of this State wisely imported from both England and America, and a wise blending of the two bloods has given us a better bird for egg production than either.

Illustration No. 12 represents about three-quarters English, carrying more weight, laying a larger egg than the winners.

Illustration No. 14 is a good specimen of the English show type, big bodied, long back and high stature, with too much bone, and looking all over a splendid specimen of the show Minorca only in white.

The best laying type of Leghorn for sustained laying in confinement would be like those shown in Illustration No. 10, laying a 25 oz. per dozen egg and going about 4 lb. per hen.

Black Orpingtons.

The original varieties of the brown egg or Asiatic on the one side, and the white egg or European on the other, existed before our ken, and constitute the original pure breeds. The Black Orpingtons are of modern development, and contain the two bloods, and is a pure breed only in intermating. The origin is of Langshan and Minorca blood—both, no doubt, the old style—and the result is a first class utility fowl. The laying type is not so easily fixed in this composite breed as it is in the Langshan and Leghorn. The pen that was second in the second test was made up of very large show-type hens, weighing about 8 lb. each; and they laid considerably over 1,200 eggs. Illustration No. 23 is very similar to them in type, this pen winning the third prize for general utility, the six hens weighing 43½ lb. Illustration

No. 9. White Leghorns. P. Lowe.

No. 17, 41 lb. for 6 hens, and laying nearly 1,200 eggs, indicates a good show type; and the single specimen—Illustration No. 18—is what we would take for a typical layer in Black Orpingtons Doubtless there is plenty of material here for the scientific selector to work up a strain of the greatest capacity. In this breed, leaving out fads, show properties and laying capacity can be combined. For the best layers and smallest eaters, or, in other words, the most payable type, keep away from the Cochin type of fluffy, big-headed fowl.

Black Orpingtons, although a plain-coloured bird, with no head ornaments, and very little room for fads, still have had to take their chance of decay through the fancy running on wrong lines. That this has been noticed by Orpington breeders this quotation from the *Daily Telegraph* of 1903 will show: "As a result of the warning thrown out by a correspondent in this column a couple of weeks ago, regarding the threatened extinction of the Black Orpington, from a utility point of view, by the preference given by judges at Sydney shows of late for the small, fluffy, Cochiny type of bird,

No 10 White Leghorn. P. Lowe

some prominent Orpington breeders have decided to take the matter up. A strong effort will be made to have only the old or Cook type recognised. Advices from England go to show that the Black Orpington is on the down grade, simply because nothing but the new type, which has an infusion of Cochin blood in it, can now win in the Old Country. These tests have amply demonstrated that Cochin blood means a large consumption of food for a small production of eggs. The true type of Black Orpington is a splendid utility fowl, and is a handsome fowl in the show-pen—why depart from it?"

A utility breeder writes as follows to the *Daily Telegraph*:—"I was pleased to read in your notes on the Black Orpingtons at the Poultry Society's Show that the size, symmetry, and utility characteristic of the birds claimed attention. To my mind—and I am sure that everyone who weighs their merits with an open mind will concur with me—the Black Orpington is not only a most symmetrical and attractive bird, but it is absolutely incomparable as a

No. 11. White Leghorns. R. Boardman.

general purpose bird. In what other breed to-day can you get such size and laying qualities combined? The recent laying competition demonstrated that the Black Orpington can hold its own with any other breed as an egg producer. As table birds they rival the Dorking, with their long, deep, plump breasts, weight of meat, whiteness of skin, and fineness of bone. I have never shown a Black Orpington—probably never will; but I have never kept a breed—and I have tried all of them during the last twenty years—that gave me such fine results. If the Black Orpington is given a fair chance, I am convinced it will be flourishing when the other varieties of the breed, and most of the other present-day breeds, are relegated to comparative oblivion. But it can only maintain its supremacy as long as its utility value is not impaired. We know that magnificent show specimens, such as we have seen this year, are quite compatible with a high standard of productiveness. It behoves all who have the interests of this grand breed at heart to see that it is not ruined by breeding purely for show. If the judges

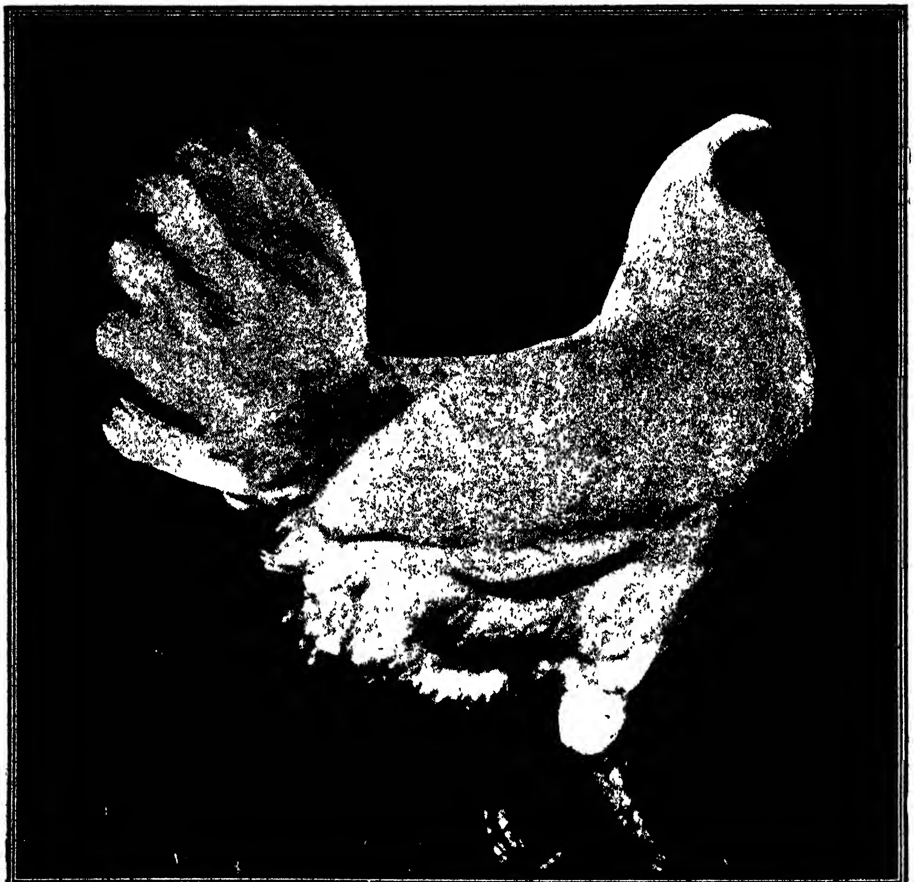
No 12. White Leghorn. R. Boardman.

will persist in giving the blue ribbon to small, fluffy, clean-legged Black Cochins—I can call them nothing else—as has been done in several instances in Sydney this autumn, then the ruination of the breed is at hand. We all know that this is the type that has come into favour in England, but I contend that we here should not be dominated by the dictum of a country where show is first and utility nowhere." It is only necessary for a leading breeder of a variety to act in collusion with a leading judge of the same variety, not criminal collusion, but coincidence of taste, to run a breed into a wrong type, which is sometimes done unconsciously by the breeder—that is to say, in Black Orpingtons a breeder might get into pure Cochins without being aware of the fact.

No. 18. White Leghorns. Mrs. G. Atkinson.

Silver Wyandottes.

This variety has made a good name in the tests. They will always be justly celebrated, through the fact of their great utility virtues being primarily the cause of the initiation of these world-renowned tests. The three great champions of Silver Wyandottes, viz., Henry, Warren, and Howell, each of whom were not disappointed in their favourites, all abandoned the breed, so far as having themselves represented by them in the competitions. Warren, however, has already returned, and, no doubt, Henry and Howell will follow. Fowls of this variety are very small consumers of food for a big egg production. They are early maturers, and in the early autumn and winter will equal, if not excel, any other breed for egg production. They are very hardy, and, away from show lacing, are easily bred to a moderate colour. Illustration No. 20 represents a typical layer and is also the correct type for the show pen, certainly not laced for exhibition, but of good medium size and typical of the Wyandotte. Illustration No. 26 shows more of the tableweight type, but, like the Black Orpington, they prove that it is possible to put out 2,113 eggs for twenty-four months, and yet carry a good carcass of



No. 14. White Leghorn Mrs. G. Atkinson.

meat for the table. But for laying we prefer medium-size type, as shown in Illustration No. 20. That there is reason to guard this variety from malformation, the following interview may be quoted between the Editor of the Poultry Column of the *Daily Telegraph* and Mr. J. H. Hemsworth, who, in addition to being a successful exhibitor of this variety for thirteen years and winning the *Daily Telegraph* Cup for Wyandottes, is a show fancier pure and simple, never having entered these egg-laying competitions. Mr. Hemsworth said:—

Ten years ago we were breeding better and truer Wyandottes—that is, they were decidedly better in type on the average than they are to-day. Of course, they were nothing like what they are now in lacing—the open lacing had not reached its present perfection; but we are undoubtedly sacrificing type for feather, and if this goes on the breed will go down. I must say that this has been the fault with almost every bird imported from England for the past two years. Of course, we have been following England, and it is time for us to pull ourselves up. I have found that on the average the birds imported from America have been better in type—fine, big, blocky birds, but without the open lacing that we want to win here.

No. 15. Minorcas. W. T. Ely.

The judges ought to pay more attention to type. Some of the winning birds in the Poultry Club show could not be beaten for lacing, but they are not Wyandottes in type. If we continue to encourage these leggy, small-bodied, hollow-chested birds, they will get further and further away from what a Wyandotte should be, and tend to the downfall of the Silver Wyandotte. Silver Wyandottes, like the Black Orpington, are selected crosses formed of the Asiatic Brahma and the European Hamburgh, the progenitors being both noted for laying capacity.

Buff Orpingtons.

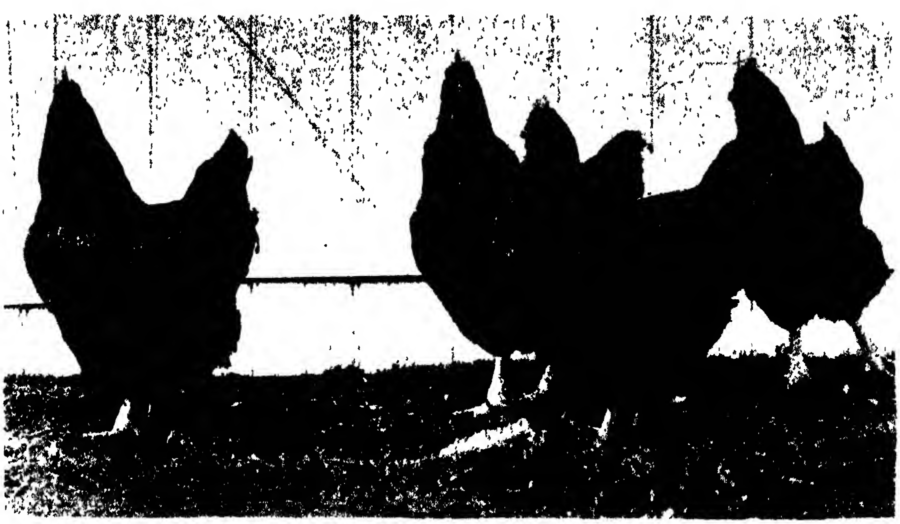
Buff Orpingtons have had a great fight with the fancier, who has nearly beaten them, by demanding buffs throughout, including tail, such birds generally beating good birds with black in tail. The Buff Orpington can be bred to

No. 16. Minorca. W. T. Ely.

produce good birds of great size and stamina, very hardy, and excellent all-round fowls; but less consideration will have to be given to buff tails. The natural tail of a buff bird is black with buff mounting; and it is always the case, that directly the fancier sets himself against nature, he gains the fad he seeks, but ultimately loses the bird. Bred to nature this is one of the finest all-round fowls known to us.

Golden Wyandottes.

Golden Wyandottes produced in America in the same way as Silvers, only using the Golden Hamburgh in place of the Silver, should be very much on a par with the Silver variety for utility in egg-production; but this has been demonstrated not to be so; and the reason has been found in the insertion of Indian Game for colour marking, to the reduction of the output of eggs;

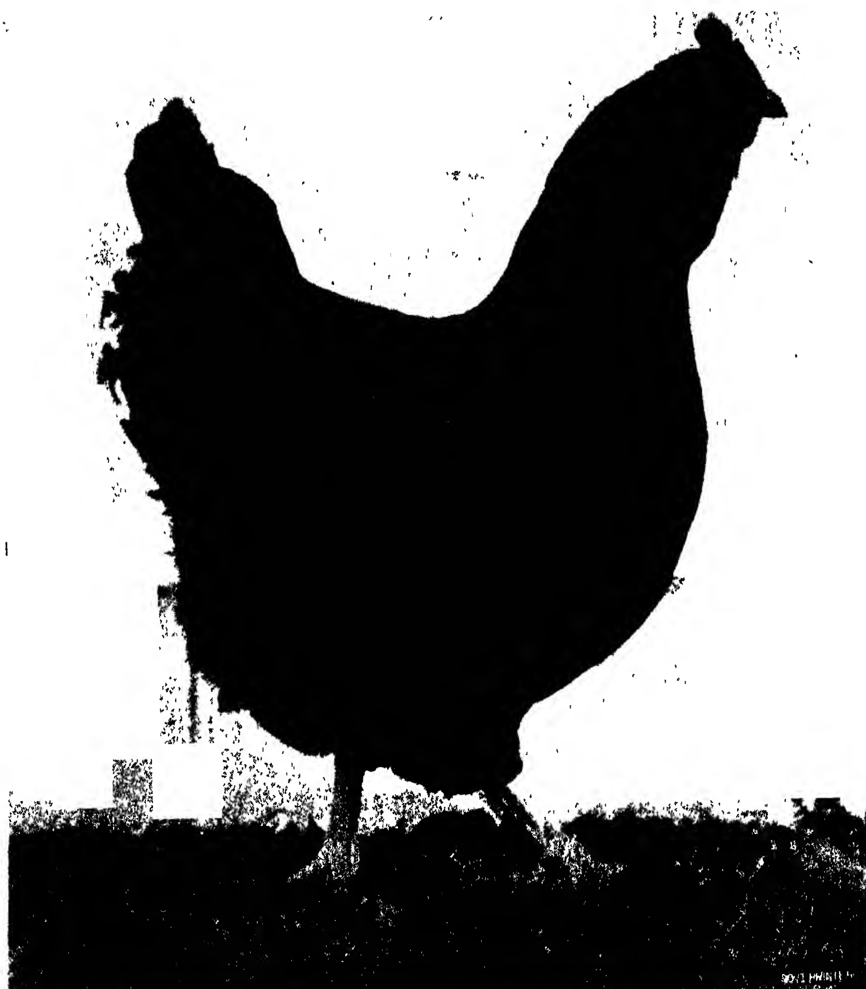


No. 17. Black Orpingtons. A. Creaser.

and if we follow in the footsteps of the English fancier, who is now showing Silver-laced Game, then good-bye to the egg productiveness of Silver Wyandottes.

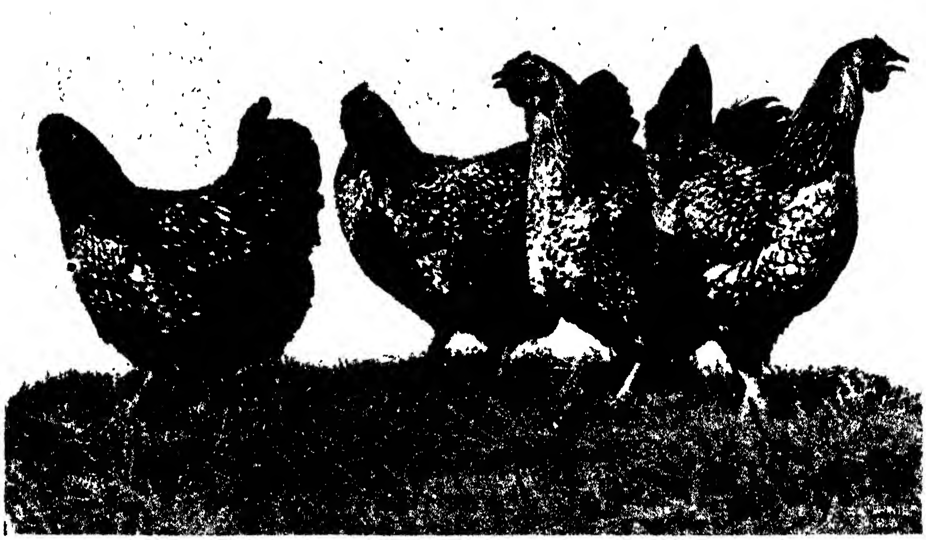
Breeds and Strains.

In the third laying competition on one of the plates on the pens, descriptive of the owner and breed, was marked,—"whose strain bred from?"—a splendid idea, had it been thoroughly understood and rightly acted upon. One of the great drawbacks to these tests has been the failure of knowing the blood constituting the competing pen, so that in the event of a pen giving an excellent showing, the owner could exactly repeat the same blood. In relation to crossing for egg-production, it is now generally accepted that no cross will lay better than the already tested pure breeds. This has been accentuated in the great laying of the "Chinese" Langshans. This great propensity must



No. 18. Black Orpington. A. Creaser.

be inherited; but inherited egg-producing strains often lose this feature. Breeding misunderstood accounts for this; the great majority of breeders make the mistake of introducing entirely different blood to an accepted strain. Atavism misunderstood accounts for telegony and also for sports, although there is no doubt of the albino being a sport; but they are of rare occurrence, and should not be mixed up with frequent cases of atavism. For improving the egg-laying capacity, selection from good layers, of strong stamina and great vigour is necessary; and while trap-nests are good, and the Hogan system a guide, single pens for single birds is the best, simplest, and easiest method. From the data given, the Poultry breeders, and especially beginners, need not have such "will o' the wisp" careers as they have had in the past, and the business has been placed on a far better financial footing.



No. 19. Silver Wyandottes. J. C. Gould.

The following is a *resumé* of the General Report, appearing in the *Daily Telegraph* of 1st April, 1908:—

EGG-LAYING COMPETITIONS AT HAWKESBURY COLLEGE.

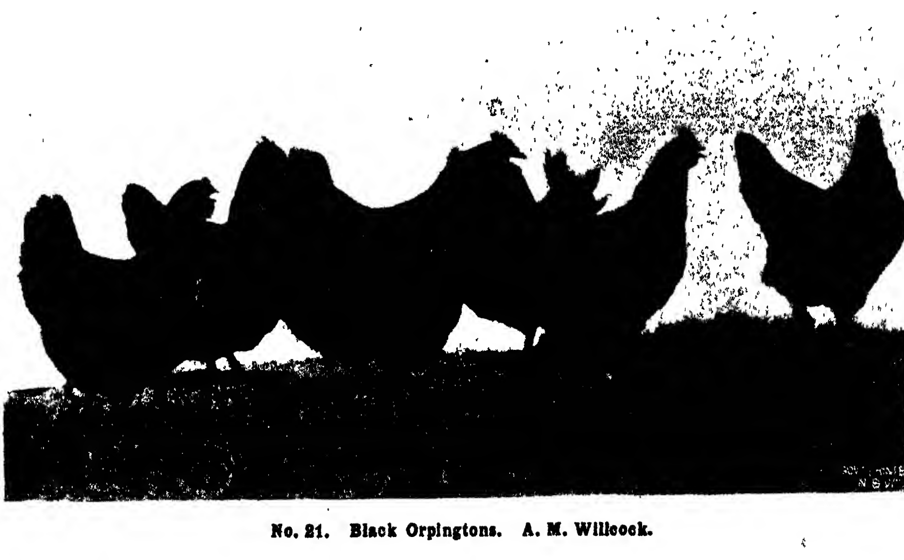
A Series of Successes.—World's First Two-years' Test.—New and Valuable Data.

At the Hawkesbury Agricultural College, yesterday, there was concluded the first two years egg-laying competition ever held in the world. The sixth annual competition also came to a close. Both were organised by *The Daily Telegraph*, and were conducted under the personal supervision of Mr. D. S. Thompson, Government Poultry Expert. The executive management was in the hands of a committee consisting of Messrs. W. S. Campbell (Director of Agriculture), H. W. Potts (Principal of the Hawkesbury Agricultural College), D. S. Thompson, A. A. Dunnicliff, jun. (*The Daily Telegraph*), and S. Ellis, J. Stewart, J. Hadlington, A. E. Henry, and E. Waldron (competitors' representatives). Liberal cash prizes were offered, totalling £120, including £50 donated by *The Daily Telegraph*. The wisdom of the committee's action last year in deciding to

No. 20. Silver Wyandotte. J. C. Gould.

extend the duration of all future competitions to two years has been abundantly justified by results, and the records now available will furnish the poultry world with the first reliable data of the laying of second-year hens, and as such they will doubtless be welcomed by Europe and America, as well as Australasia. The following compares the average number and value of eggs laid per hen by the different breeds during the first and second year respectively :—

Breed.	Eggs per Hen.		Value per Hen.	
	1st year.	2nd year.	1st year.	2nd year.
12 Langshans	210·6	138·5	19/1	14/1
6 Cuckoo Leghorns	190·1	153·0	16/10½	14/7½
6 Buff Leghorns	196·0	158·3	16/10	14/5½
48 White Leghorns	201·2	144·8	17/5½	13/6
6 Buff Orpingtons	182·6	161·0	16/3	14/6
12 Brown Leghorns	191·8	128·5	16/1½	12/9½
54 Silver Wyandottes	179 6	127·1	15/10	13/0½
6 White Wyandottes	169·1	120·1	15/9	12/2
72 Black Orpingtons	187·7	115·7	16/9	11/
6 Rhode Island Reds	166·6	123·0	14/2	12/3
6 Buff Wyandottes	165 5	118·8	14/4	11/10
6 Minorcas	170·8	123·6	13/3	11/10½



No. 21. Black Orpingtons. A. M. Willcock.

The Prize Winners.

The prize money amounted to £55 for the second year, and was won as follows :—

Greatest number of eggs in the two years :—

	£	s.	d.		£	s.	d.
1. J. R. Wakfer...	4	0	0	3. S. Ellis	2	0	0
2. S. Gordon	3	0	0	4. G. H. Arkinstall	1	0	0

Greatest number of eggs in the second twelve months :—

	£	s.	d.		£	s.	d.
1. S. Gordon, 1,054 eggs ...	5	0	0	4. Heydon & Shepherd, 979 eggs	2	0	0
2. J. R. Wakfer, 1,006 eggs ...	3	0	0	5. S. Wade, jun., 963 eggs ...	1	10	0
3. J. Stewart, 986 eggs ...	2	10	0	6. A. H. Hobden, 950 eggs ...	1	0	0

No. 22. Black Orpington. S. Gordon.

Winter test, second year (April to July inclusive):—

	£	s.	d.		£	s.	d.
1. J. R. Wakfer, 328 eggs ...	2	10	0	3. Miss M. McDonald, 274 eggs	1	0	0
2. S. Gordon, 306 eggs	2	0	0	4. S. Wade, junior, 271 eggs ...	0	10	0

Market value of eggs for the two years:—

	£	s.	d.		£	s.	d.
1. J. R. Wakfer...	3	0	0	3. S. Ellis	1	10	0
2. S. Gordon	2	0	0	4. G. H. Arkinstall	0	10	0

Monthly prize of £1 for the highest total from a pen:—

April, S. Wade, junior	97 eggs	October, Heydon and Shepherd	145 eggs
May, J. R. Wakfer	94 ,,	November, Heydon and Shepherd	135 ,,
June, J. R. Wakfer & J. Gamble equal	84 ,,	December, A. D. Craig ...	137 ,,
July, S. Gordon	96 ,,	January, A. D. Craig	130 ,,
August, A. H. Hobden	135 ,,	February, Mrs. R. E. Warren	94 ,,
September, M. Ireland	146 ,,	March, S. Wade, junior ...	87 ,,

Champion silver cup, value £5, for the pen laying the most eggs in the two years, without the replacement of a bird:—

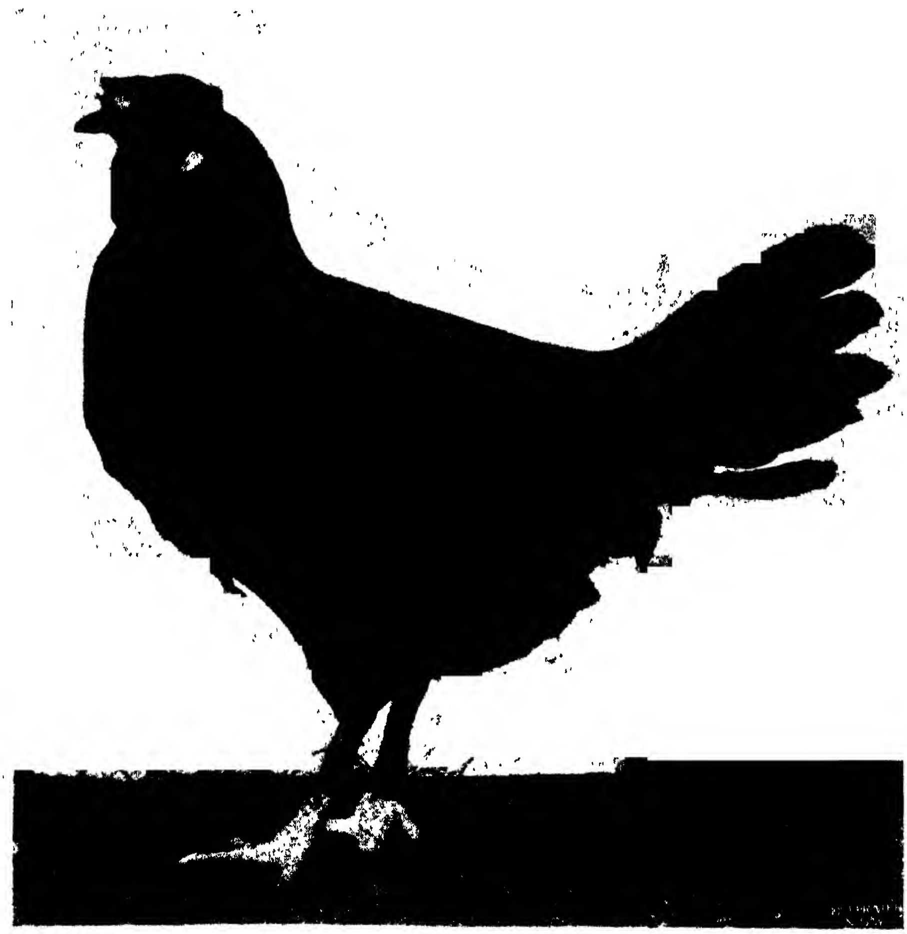
J. R. Wakfer.

No. 23. Black Orpingtons. W. Wills.

Mr. Thompson's Review.

After the success attending the five complete series of annual tests, in which data was accumulated which proved original and of great value and acceptability to many parts of the world, it was a happy thought of the organising secretary and management to test the productiveness and stamina of hens for a further period of twelve months.

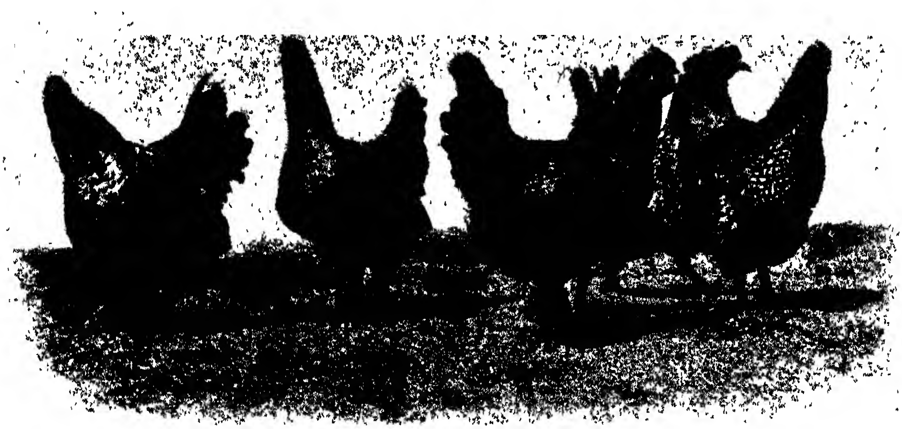
Just as the five preceding tests were the first of their kind in the world, so now will the demonstration be the first of a practical test in comparison with the capacity, stamina, and profitableness of first and second year hens. Until these competitions were commenced a great many erroneous ideas prevailed in regard to poultry-keeping. Many of them have been dispelled. No doubt the present data in regard to second-year hens will be new to the scientist in that the time is not yet that the whole of the eggs contained in the ovary of a hen can be rushed out in the short space of twelve months, yet it will be new to the layman that it is now getting possible to bring out the seven years' laying capacity of a hen in the space of twenty-four months.



No. 24. Minorca. A. J. Wood.

Breeding for Stamina.

There is still a good deal to learn as to how this can be done, not only in the output of the desired number of eggs in the shortest time, but in accomplishing this with the least possible mortality. This is where the records of a two years' test will be of great value. The series of five one-year tests demonstrated how to breed, when to breed, how to feed, when to feed, and what to feed, and brought the accomplishment of a possible lay of 250 eggs per hen, and now the two years' test has proved that this can be done without the loss of a single hen, the two leading pens running right through the two-years' ordeal without the replacement of a bird. Now this, compared with the fact that some pens lost 50 per cent. of the competing hens, opens up a big avenue of thought and research during the future continuance of these tests which may solve for us this problem. Great egg machines, to put out large numbers of eggs in a short time, is only one part; how to do this without the early breaking up of the machine is the other. These two-year tests should do a great deal of good in this way. To get early pullets, which is absolutely necessary to make poultry farming pay, breeders have had to resort to breeding from untried pullets with many hereditary afflictions, thus increasing weakness of stamina and susceptibility to disease, and if only the tried specimens of two years are bred from, a bird of stronger stamina will be produced.



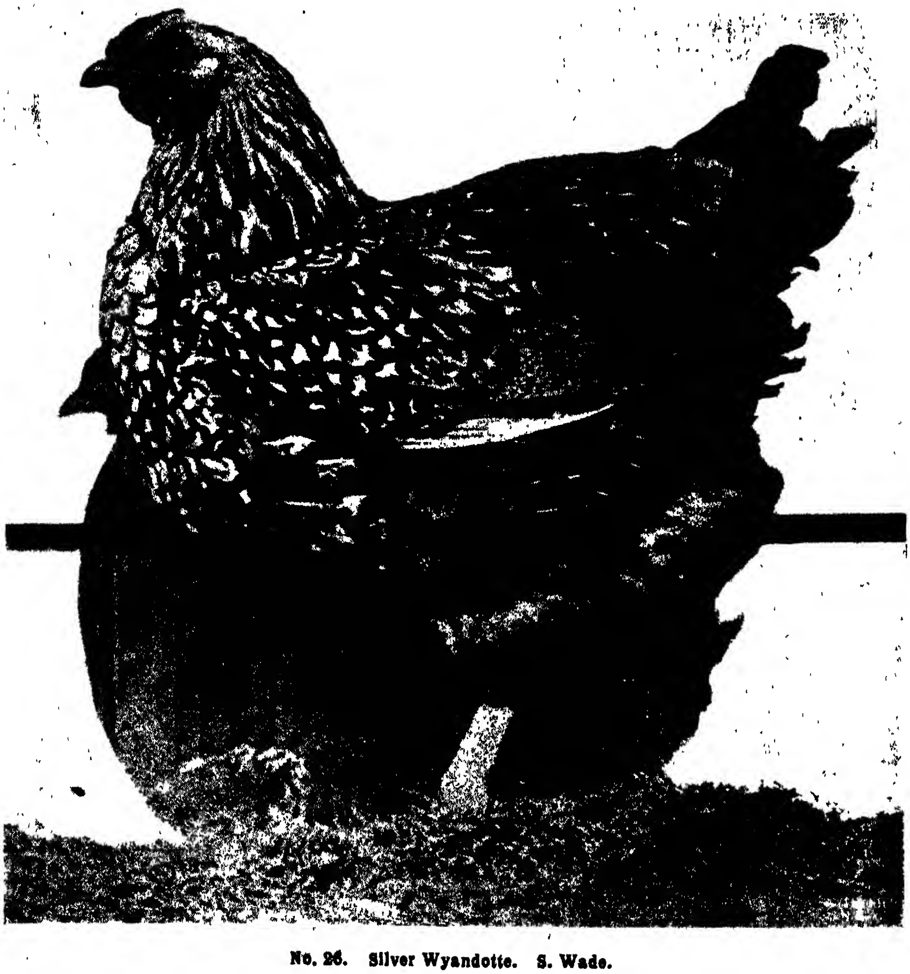
No. 25. Silver Wyandottes D. Salter.

Weather Conditions.

April and May passed over very dry, and with very little frosty weather. June gave us 3 inches of rain in twenty-one days, and was accompanied with continued cold weather, which had rather a depressing effect on the output. July was a very dry month, with very many severe frosts, but they had no harmful effect. Frosts continued at intervals throughout August and September, and October followed very dry, and with the continuance of the drought right throughout November, December, and January, the pens were completely denuded of grass, and green food was quite unobtainable. Ten inches of rain in February gave a beautiful grassy sward, which was much relished by the hens. Altogether, however, the seasons have been favourable to good results.

Mortality and Disease.

Chicken-pox was much less prevalent than in former tests, and scaly leg gave much less trouble; no other infectious diseases have been met with, and the only and great trouble, which no doubt can be mitigated, is the hereditary weakness of the ovary and its connections. As already stated, this has been brought about by excessive laying, without



No. 26. Silver Wyandotte. S. Wade.

No. 27. Langshan. J. R. Walker.

the co-relative strength or stamina. It is general to all breeds. It might have been expected that the heavy breeds would have suffered the most in this way, being more readily fattened, but it is not the case, Leghorns, Minorcas, Hamburghs, and all the light breeds being equally affected.

The total replacement for the two years was 26 hens, or 10 per cent., 14 as pullets in the first year, and 12 as hens; so that the mortality amongst the old hens was less than as pullets the previous year, a fact which would have been expected to have worked out in the opposite way.

TWO-YEAR TEST.

Financial Result and Record.

The two years' test has demonstrated that it will pay to carry the best layers over the moult for the second year's laying Here is an illustration of the benefit of the divisional pen system. With the picking out of the most likely pullets, and penning them up in pens in grades of best, second best, and third best layers, it will be found that many of the pens will pay very well to keep for a second term, and just as decisive will the fact be that many of them will not pay. To market the second and third grades will add to the profit of the best. For this, the first double test, it was found that the pullets laid an average value of 17s. 2d. per head, and consumed 7s. worth of food, leaving a profit per head of 10s. 2d., while the old hens yielded 12s. 6½d. worth of eggs, and consumed 6s. 4d. worth of food, leaving a profit per head of 6s. 2½d., and a great advantage to the poultry farmer would be the increased weight of the eggs. It was found that in the general average the weights increased appreciably in the eggs laid in the second term.

The average prices for foodstuffs was higher than for any previous year, and following a succession of bad seasons and high prices, the last cycle of years have been ruinous to the poultry industry. Maize runs up to the high average for the competition of 4s. 3d. per bushel for the year, wheat 4s. 1d., pollard 1s. 2d., and bran 1s. 1d. As these prices included a low contract price of 3s. 3d. for maize and wheat, and 11d. for pollard and bran, for the first six months, the price to the breeders buying in the open market would have been even higher.

The total cost of feeding the 240 old hens was :—Bran and pollard, £20 ; grain, £40 ; meat, £8 ; green feed, £4 ; shell grit, £3 ; sundries, £1 ; total, £76.

The total monthly laying was :—April, 1,646 eggs; May, 1,086; June, 1,321; July, 2,008; August, 3,691 ; September, 3,891 ; October, 3,968 ; November, 3,447 ; December, 3,082 ; January, 2,759 ; February, 2,060 ; March, 2,018 ; grand total, 29,756 ; average, 124 eggs per hen for the second year. The average of these hens in the first year was 180 eggs each.

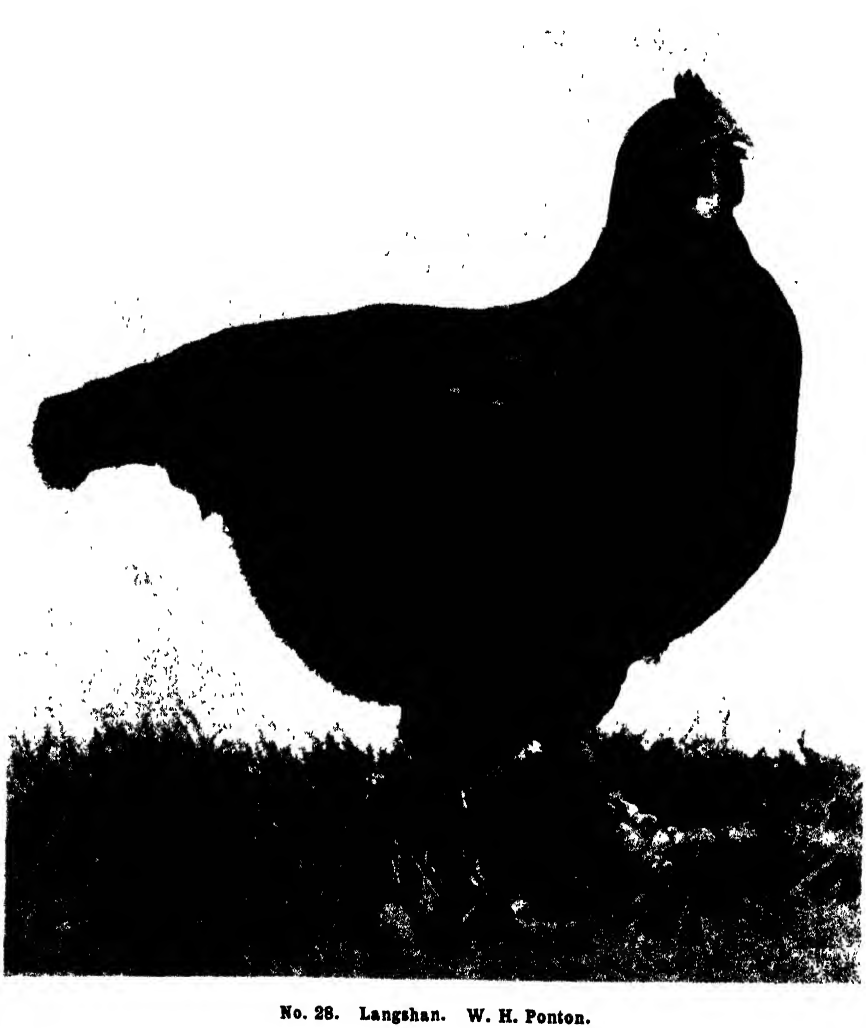
The monthly range of prices for first-grade eggs was :—April, 1s. 9d. to 2s. ; May, 1s. 10d. to 1s. 11d. ; June, 1s. 11d. to 1s. 6d. ; July, 1s. 8d. to 1s. ; August, 1s. 11d. to 9d. ; September, 9¾d. to 10¾d. ; October, 10d. to 10½d. ; November, 10d. to 1s. ; December, 1s. to 1s. 6d. ; January, 1s. 2d. to 1s. 7d. ; February, 1s. 6d. to 1s. 8d. ; March, 1s. 8½d. to 1s. 11d. per dozen.

The total net market value of the eggs was £150 12s. 9d., from which deduct the cost of feed, £76, and a surplus of £74 12s. 9d. remains.

The appended table gives full details of the eggs laid and the net market value from each pen of six hens. The figures in parentheses following competitors' names indicate the number of hens replaced during the two years.

EGGS laid, and net market value of the eggs from each pen of six hens.

Owner, Address, Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total 2nd year.	Grand Total.	Weight per doz.	Market Value.
																oz.	
1. J. R. Wakfer (0), Chatswood : Langshans	1481	86	94	84	67	117	84	107	92	69	61	69	76	1006	2487	25	241/6
2. S. Gordon (0), St. Ives : Black Orpingtons .. .	1247	82	72	56	96	132	123	100	92	90	83	58	70	1054	2301	25	216/8
3. S. Ellis (2), Botany : White Leghorns	1437	41	2	38	93	102	100	114	83	69	85	65	49	841	2278	27	210/2
4. G. H. Arkinstall (3), Inverell : White Leghorns .. .	1373	42	20	73	59	92	96	112	88	95	89	69	60	895	2268	26½	209/5
5. J. Stewart (1), Berowra : White Leghorns	1193	40	37	31	78	115	126	125	123	100	87	62	62	986	2179	26	201/9
6. A. D. Craig (0), Baulkham Hills : White Leghorns ..	1222	8	3	0	42	94	127	137	132	137	130	72	58	940	2162	26½	190/8
7. Heydon and Shepherd (1), Brucedale : Brown Leghorns ..	1169	14	0	13	44	125	134	145	135	128	107	82	52	979	2148	26½	195 9
8. A. H Hobden (1), Fernhill : Buff Leghorns	1176	10	12	61	69	135	133	133	122	105	74	51	45	950	2126	24½	187/9
9 S. Wade, jun. (1), Tamworth : Silver Wyandottes .. .	1150	97	64	66	44	88	92	110	86	83	65	81	87	963	2113	26	206/8
10. M. Ireland (0), Cumnock : Black Orpingtons	1220	13	2	32	57	105	146	116	96	85	83	40	65	840	2060	26½	188/-
11. W. Mitchell (1), North Ryde : Cuckoo Leghorns .	1141	54	24	39	77	126	107	95	99	70	92	67	68	918	2059	25½	189/-
12. H. E. Kelly (2), Ashfield : Black Orpingtons	1254	49	37	16	46	82	121	103	95	85	52	62	44	792	2046	26½	186/9
13. P. Allder (0), Sefton Park : White Leghorns	1163	31	3	44	72	101	99	110	106	100	97	53	33	849	2012	26½	176/8
14. T. Maguire (0), Mittagong : White Leghorns .. .	1151	10	7	12	65	104	111	132	125	121	110	36	1	834	1985	25	171/5
15. B. Poole (0), Leichhardt : Silver Wyandottes	1138	71	69	55	66	83	105	107	61	61	56	33	77	844	1982	24	187/7
16. L. W. Nicholson (0), The Oaks : Silver Wyandottes .. .	1085	67	37	39	30	109	103	102	92	78	80	66	75	883	1968	25½	184/8
17. C. N. Soutter (0), Tuggerah : Buff Orpingtons	1096	77	44	44	46	118	98	92	69	62	73	52	70	845	1941	26½	185/8
18. J. A Baird (0), Five Dock : Black Orpingtons	1132	53	32	38	54	103	98	88	81	76	43	50	69	785	1917	25	179/4
19. F. J. Brierly (0), Carlingford : White Leghorns .. .	1133	35	0	1	46	94	101	111	109	87	95	59	27	765	1898	27	166/2
20. W. O. Hudson (1), North Ryde : Black Orpingtons . .	1157	35	1	19	40	79	109	96	67	74	82	68	52	722	1879	27½	173/-
21. R. H. Blamey (3), Kogarah : Black Orpingtons	1256	21	1	0	38	105	91	99	69	64	44	32	50	615	1871	29½	167/9
22. E. F. Silcock (0), Armidale : Silver Wyandottes . .	1035	68	40	36	62	115	106	94	72	68	52	46	64	823	1858	24½	169/7
23. W. J. Leaver (1), Moss Vale : Silver Wyandottes	1167	67	19	32	40	90	77	80	58	65	50	42	53	679	1846	26½	169/7
24. Miss McDonald (0), Five Dock : Silver Wyandottes .. .	1149	85	88	59	42	74	79	86	55	45	31	29	14	687	1836	27½	174/3
25. Mrs. R. E. Warren (0), Glenfield : White Leghorns	985	12	0	1	49	61	97	102	117	126	125	94	59	843	1828	25½	163 7
26. J. Loughman (2), Maclean : Black Orpingtons	1037	40	44	37	29	74	109	94	92	61	65	52	59	756	1793	29	160/9
27. Stewart Bros. (0), Berowra : White Wyandottes . ..	1069	60	47	18	69	84	90	66	72	68	52	42	53	721	1790	25	167/8
28. A. J. Wood (0), Quirindi : Minorcas	1025	15	3	9	24	104	114	108	111	88	71	42	53	742	1767	28	148/3
29. Grantham Poultry Farm (1), Seven Hills : Silver Wyandottes	985	28	35	48	68	103	110	88	88	78	50	40	27	763	1748	24	157/3
30. Veness and Fox (0), Ashfield : Silver Wyandottes .. .	1037	41	49	24	45	78	96	65	67	64	59	42	80	710	1747	25½	164/3
31. W. L. Andrew (0), Beecroft : Rhode Island Reds .. .	1000	42	25	21	47	83	78	79	83	68	67	79	66	738	1738	26½	158/7
32. J. Gamble (1), Ashfield : Black Orpingtons	1142	13	34	84	59	78	57	69	44	42	28	28	36	572	1714	25½	166/2
33. A. E. Henry (0), Ryde : Buff Wyandottes	993	64	67	66	47	61	84	86	84	66	48	20	20	713	1706	24	159/2
34. E. J. Winton (1), Nowra : Langshans	1047	27	27	60	55	75	81	91	55	35	66	33	51	656	1703	26	156 5
35. T. A. Hutchinson (2), Manly : Brown Leghorns	1133	13	3	9	20	36	101	107	86	83	50	27	28	563	1696	24½	151/6
36. Mrs. E. Scaysbrook (0), Gosford : Black Orpingtons .	1108	29	11	17	32	99	80	56	57	53	53	51	27	565	1673	26½	157/1
37. L. L. Ramsay (1), Carlingford : Black Orpingtons	1064	2	17	1	23	85	80	96	69	63	39	64	28	567	1631	26½	144/7
38. W. Wild (0), Lake Albert : Black Orpingtons	999	19	7	37	34	51	94	99	81	64	59	15	18	578	1577	26½	133/9
39. D. B. Kirk (1), Merrylands : Silver Wyandottes	952	61	8	1	24	57	78	92	73	60	64	52	42	612	1564	25½	143/8
40. Wickham and Scarr (0), Roseville : Black Orpingtons .	898	22	1	0	10	74	71	77	61	46	37	35	50	484	1382	26½	124/8



No. 28. Langshan. W. H. Ponton.

SIXTH ANNUAL TEST.

The average laying in the sixth annual competition shows a slight gain on the best results obtained in previous tests of the series. The first fifty pens will continue for another twelve months, to conclude the second two-years' test. The following compares the results of the six competitions :—

	1st.	2nd.	3rd.	4th.	5th.	6th.
Number of pens	38	70	100	100	100	60
Winning pen's total ...	1,113	1,308	1,224	1,411	1,481	1,474
Lowest pen's total	459	666	532	635	721	665
Highest monthly total . ..	137	160	154	168	162	161
Average eggs per pen	130	163	152	166	171	173
Greatest value of eggs	140/-	150/-	114/-	125/-	137/-	149/-
Average price of eggs . .	1/1	1/3¾	1/-	/11½	1/0½	1/2¼
Average value per hen	15/6	17/9½	12/9	13/3½	14/10	17/2
Cost of feed per hen	6/-	5/9¾	4/5½	5/3½	5/10	7/-
Profit over feed	9/6	11/11¼	8/3½	8/-	9/-	10/2

The analyses of the average productions of and the value of the eggs laid per hen by the various breeds, are as follows :—

Breed.	Eggs per Hen.	Value per Hen.
138 White Leghorns	195·0	19/2¾
18 Minorcas .. .	177·0	17/-
96 Black Orpingtons	169 2	16/9½
6 Andalusians	165·8	16/-
60 Silver Wyandottes	160·2	15/7½
6 Buff Leghorns	159·3	15/2½
6 Langshans	149·5	14/9
6 Black Hamburghs.	144·5	13/8½
12 Buff Orpingtons	133·5	13/2½
12 Brown Leghorns	131·4	12/10

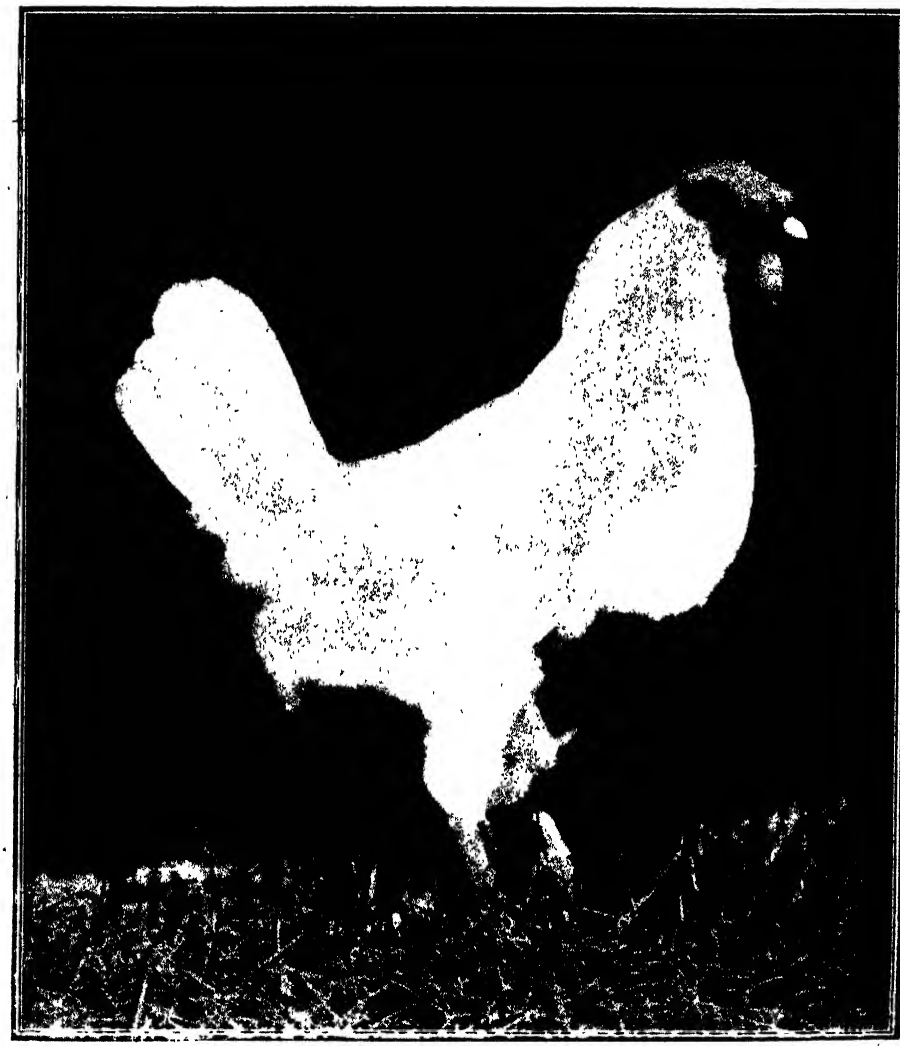
The Prize List.

The prize money for this competition totalled £65, and was won as follows, only pens laying eggs weighing 24 oz. per dozen before the expiration of the first four months being eligible for a prize :—

Greatest number of eggs in the twelve months :—

	£	s.	d.		£	s.	d.
1. P. Lowe	7	0	0	7 A. Arnold	1	0	0
2. R. Boardman	5	0	0	8. W. E. Boutcher	1	0	0
3. Mrs. G. Atkinson	4	0	0	9. J. B. Littlewood	1	0	0
4. J. Jensen	3	0	0	10. A. F. Emmott	0	10	0
5. L. S. Luck	2	0	0	11. Wharepaka Poultry Yards...	0	10	0
6. Griffiths Bros.	1	10	0	12. A. Creaser	0	10	0

No. 29. White Leghorn. S. Ellis.



No. 30. White Leghorn. J. Stewart.

Market value of eggs for the twelve months :—

	£	s.	d.		£	s.	d.
1. P. Lowe	3	0	0	3. Mrs. G. Atkinson .. .	1	0	0
2. R. Boardman	2	0	0	4. L. S. Luck	0	10	0

First month (open to pens laying 70 eggs or more) :—

	£	s.	d.		£	s.	d.
1. F. Hopkins, 116 eggs... ...	2	0	0	3. Cowan Bros., 92 eggs ..	0	10	0
2. Mrs. A. Page, 97 eggs ...	1	0	0				

Winter test (first four months) :—

	£	s.	d.		£	s.	d.
1. Cowan Bros., 410 eggs ..	4	0	0	3. W. E. Boutcher, 384 eggs ..	2	0	0
2. Mrs. G. Atkinson, 387 eggs ..	3	0	0	4. P. Lowe, 379 eggs	1	0	0

Last three months :—

	£	s.	d.		£	s.	d.
1. R. Boardman, 359 eggs ...	2	0	0	3. P Lowe, 343 eggs	0	10	0
2. L. S. Luck, 347 eggs	2	0	0				

General utility prizes (open to pens the hens in which average at least 6 lb. in weight at noon on 1st March, 1908, decided by the number of eggs) :—

	£	s.	d.		£	s.	d.
1. A. Creaser, total weight of hens, 41 lb.	2	0	0	2. Mrs. A. M. Wilcock, 39 lb.	1	0	0
				3. W. Wills, 43½ lb.	0	10	0

Monthly prize of £1 for the greatest number of eggs from a pen, April excepted :—

May, P. Lowe	118 eggs	November, P. Lowe ...	143 eggs
June, Cowan Bros. ...	132 ,,	December, R. Boardman .	143 ,,
July, A. W. Duke . .	161 ,,	January, R. Boardman	133 ,,
August, P. Lowe... .. .	157 ,,	February, R. Boardman	109 ,,
September, P. Lowe	158 ,,	March, P. Lowe	135 ,,
October, P. Lowe . ..	161 ,,		

The Conductor's Notes.

"The pullets," Mr. Thompson reports, "have given an excellent record; and although only a very slight advance over every previous test, it is satisfactory that still an improvement can be looked for in the general average. There has been an improvement of over 33 per cent. from the first general average, and the same percentage improvement in the highest aggregate. The deaths and replacements amongst the 360 pullets totalled 31, or an average of 8·6 per cent. The total cost of feeding the 360 birds was: Bran and pollard, £39 10s.; grain, £64 15s.; meat, £12; green feed, £4 15s.; shell grit, £4; sundries, £1 10s.; total, £126 10s."

The total monthly laying was :—April, 2,258 eggs; May, 2,482: June, 4,283; July, 5,657; August, 7,525; September, 7,707; October, 7,247; November, 6,206; December, 5,705; January, 5,089; February, 3,738; March, 4,421. Grand total, 62,318; average per hen, 173.

The total net market value of the eggs was £309 4s. 1d., and the cost of feed £126 10s., leaving a surplus of £182 14s. 1d.

The appended table gives full details of the eggs laid and the net market value of the eggs from each pen of six hens, the replacements of birds being indicated by the figures in parentheses after competitors' names.

EGGS laid, and net market value of the eggs from each hen.

Owner, Address, Breed.	April	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. P. Lowe (0), Lower Portland : White Leghorns	73	118	103	85	157	158	161	143	133	117	91	135	1474	24	149/9
2. R. Boardman (0), Camden : White Leghorns	44	42	86	112	137	140	147	141	143	133	109	117	1351	27	135 9
3. Mrs. G. Atkinson (0), Belmore : White Leghorns	73	90	124	100	133	153	146	122	109	95	87	90	1322	26	133/4
4. J. Jensen (0), Sefton Park : White Leghorns ..	25	63	122	124	130	138	142	124	129	118	89	98	1302	24½	130/1
5. L. S. Luck (0), Moruya : White Leghorns	80	93	44	57	131	142	138	128	133	130	108	109	1298	25	131/1
6. Griffiths Bros. (0), French's Forest : White Leghorns	36	32	66	129	139	152	150	129	137	124	93	80	1267	24½	123/2
7. A. Arnold (0), Ashfield : White Leghorns ..	26	87	127	137	148	139	142	112	86	89	44	110	1247	26	125/9
8. W. E. Boutcher (1), Canterbury : White Leghorns	81	112	93	98	138	139	141	138	127	112	42	24	1245	24½	121/7
9. J. B. Littlewood (1), Milton : White Leghorns	53	78	114	120	122	1 8	147	104	110	83	49	93	1220	27½	122/3
10. A. F. Emmott (0), Moruya : White Leghorns .	43	70	102	124	132	136	144	113	114	94	77	69	1218	24	123/-
11. Wharepaka Yards (0), Wahroonga : White Leghorns	62	83	99	88	134	144	130	132	115	93	65	60	1210	25½	120/1
12. W. T. Ely (0), Rydalmere : Minorcas	11	19	77	105	105	142	135	125	110	128	111	111	1179	23	114/9
13 A. Creaser (1), Enfield : Black Orpingtons	47	82	77	94	128	134	122	118	95	78	88	99	1162	25	117/9
14. Johnson Bros. (0), Marsfield : White Leghorns	27	40	74	104	131	130	129	124	116	110	69	94	1148	26½	112/9
15. P. N. Walker (3), Emu Plains : White Leghorns	34	71	112	122	137	126	114	84	79	93	82	77	1131	26½	115/6
16. F. Hopkins (1), Byron Bay : White Leghorns..	104	49	27	111	124	105	110	93	93	99	90	125	1130	24½	117/4
17 J. C. Gould (0), Wallsend : Silver Wyandottes	11	48	76	143	153	138	117	108	91	80	44	111	1125	25½	111/5
18. W. F. Hunt (0), Berowra : White Leghorns ..	51	86	52	81	133	133	134	125	106	98	66	60	1125	26	108 9
19. J. Duncan (1), Wollongbar : White Leghorns..	17	56	82	102	136	140	128	121	106	89	61	85	1123	27½	110/9
20. Mrs. A. M. Wilcock (2), Arncliffe : Black Orpingtons	53	86	103	124	137	136	122	90	80	69	60	63	1123	25	106/
21. W. Wills (1), St. Ives : Black Orpingtons ..	20	63	91	104	90	138	133	124	116	78	56	99	1112	25½	110 8
22. W. J. Napier (0), North Ryde : White Leghorns	26	87	66	84	109	132	131	113	109	104	69	50	1080	24	104/8
23. Mrs. W Sidwell (0), Bowning : Silver Wyandottes	26	47	89	128	145	129	108	83	94	73	65	87	1074	24	106/3
24. Mrs. T. Partridge (2), Marrickville : White Leghorns	43	38	45	73	128	140	143	121	128	106	55	54	1074	26	102/-
25. D. Salter (0), Wilberforce : Silver Wyandottes	80	49	50	75	129	130	117	91	92	90	74	94	1071	25	107/3
26. Freeman Bros. (1), Five Dock : Minorcas ..	5	82	100	93	124	130	91	103	73	107	66	77	1060	27½	105 4
27. D. Darragh (1), Ashfield : White Leghorns	44	36	21	76	136	131	141	121	105	100	74	66	1059	25½	100/6
28. W. White (1), Stanmore : Black Orpingtons .	77	56	86	108	108	119	115	82	69	70	68	95	1053	25	108/9
29. S. J. M'Barron (1), Alstonville : White Leghorns	30	65	63	70	117	140	136	111	103	95	60	56	1046	25½	100/9
30. Mrs. Blacklow (1), Kogarah : Black Orpingtons	18	43	48	123	140	120	121	98	106	78	56	85	1036	26½	100/9

Eggs laid, and net market value of the eggs from each hen.

Owner, Address, Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight, per doz.	Market Value.
														oz.	
31. H. A. Doyle (0), Dulwich Hill: Black Orpingtons	27	24	118	101	136	142	117	80	97	70	51	71	1034	25½	99/7
32. E. A. Thomas (0), Inverell: Black Orpingtons	2	25	61	132	142	148	116	102	84	84	60	65	1021	25½	97/9
33. Cowan Bros. (1), Burwood: Black Orpingtons ..	85	92	132	101	131	81	93	79	47	57	47	75	1020	27½	107/-
34. M. A. Vennard (0), Marsfield: White Leghorns	46	2	15	49	169	132	146	129	112	101	73	95	1009	24½	96/4
35. Mrs. A. Page (1), Enfield Black Orpingtons ..	91	71	51	80	122	108	106	105	77	61	55	80	1007	24	102/6
36. A. W. Duke (0), Nyngan: Black Orpingtons .	7	0	71	161	154	129	115	94	80	84	40	69	1004	27½	96/3
37. N. B. Ralston (0), Fairfield: Silver Wyandottes	66	57	47	103	132	130	107	87	73	76	67	56	1001	26	99/3
38. H. A. Jones (0), Thornleigh: Black Orpingtons .	50	76	60	83	135	131	94	104	76	71	66	54	1000	27	99/-
39. J. A. Salter (0), Camden: Andalusian . ..	33	4	45	53	119	128	138	101	108	102	69	85	995	28½	96/1
40. H. J. Hollier (0), Emu Plains: Silver Wyandottes .	31	61	63	109	124	119	95	101	87	74	58	71	993	26	97/7
41. E. Waldron (0), Willoughby: Black Orpingtons	69	35	5	60	143	126	127	94	99	71	76	86	991	26	95/9
42. A. J. Laraghy (0), Singleton: Silver Wyandottes ..	5	6	56	120	129	110	120	103	86	79	77	95	986	25	95/2
43. Mrs. N. Williams (1), Abbotsford: Black Orpingtons	84	81	109	69	106	104	113	72	62	65	50	68	983	26	101/8
44. G. Howell (0), Wenthworthville: Silver Wyandottes	53	85	103	99	103	114	94	73	55	64	60	73	976	25	96/4
45. J. Morgan (0), Port Kembla: Buff Leghorns	9	8	102	101	123	115	125	108	87	91	38	46	973	24½	91/3
46. F. J. Wood (1), Ashfield: Minorcas ..	6	21	42	54	121	130	141	129	106	85	59	50	944	24	86/4
47. J. Carroll (1), Belmore: Black Orpingtons .. .	52	79	73	121	120	110	95	67	69	60	54	37	937	25½	95/1
48. T. Masters (0), Canley Vale: White Leghorns .	29	6	40	41	112	134	136	124	131	124	28	29	934	25	83/7
49. J. Waugh (0), Kurri Kurri: Brown Leghorns .	1	42	94	96	113	116	112	104	92	61	40	41	912	25	87/2
50. C. Jones, jun. (0), Rooty Hill: White Leghorns	30	40	28	68	130	129	119	113	113	81	12	44	907	25½	85/7
51. W. Churchill (1), Bexley: Black Orpingtons ..	15	57	80	90	134	125	101	72	67	47	45	64	892	26	88/9
52. W. H. Ponton (1), Tuggerah: Langshans .	16	66	69	76	110	118	121	94	55	64	38	70	897	28	88/6
53. H. Coltman, jun (1), Woonona: Black Orpingtons .	3	27	76	94	128	110	93	74	72	65	52	78	872	24½	85/3
54. J. W. Woodland (3), Penrith: Black Hamburghs	2	14	46	66	89	129	122	83	97	86	67	66	867	25½	82/3
55. R. W Stone (0), Annandale: Silver Wyandottes	1	0	18	100	137	113	123	89	88	49	50	61	859	23	76/9
56. M. Ward (0), Gosford: Silver Wyandottes	31	26	48	80	108	106	95	89	67	64	86	39	839	25	80/7
57. C. J. Green (0), Carlingford: Buff Orpingtons	35	47	67	88	114	100	93	63	58	44	34	63	806	25	81/2
58. A. C. Rule (0), Croydon: Buff Orpingtons	8	18	43	83	101	118	83	79	71	65	64	63	796	25½	77/6
59. J. Anderson (1), Guildford: Silver Wyandottes . . .	44	39	46	69	87	85	68	72	63	55	13	51	692	26½	69/1
60. A. Robertson (0), Epping: Brown Leghorns	7	7	6	14	102	138	104	101	106	56	21	3	665	24	66/9

Breeding Sheep for Mutton.

G. M. McKEOWN,
Wagga Experiment Farm.

Sheep for Mutton.

For some time at the Wagga Experiment Farm trials of cross-bred sheep have been carried out primarily with a view to ascertaining the most profitable sheep for the comparatively small landholder, and the best methods of increasing the carrying capacity of his property.

The most profitable method of sheep-breeding for him is undoubtedly that of producing lambs for early sale as freezers for export or for home consumption, as at the age of 4 to 5 months the lambs are saleable at prices practically equal to the value of their dams, and he has in addition the proceeds of the wool of both ewes and lambs.

Assuming, therefore, that the lambing average is 90 per cent.—and in any fair season there is no reason why it should not reach, or even exceed this figure—a grazier needs only to provide pasture for half, or a little over half, his full number of sheep for the entire year.

Lambs (6½ months) by Shropshire Rams from Lincoln-Merino Ewes.

As the mating of the rams and ewes should be arranged so that the lambs shall be dropped at the time that the most succulent pasture is available, the full number of sheep will be carried during the season when pastures, whether natural or prepared, are at their best. About 2 per cent. of vigorous rams will ensure an even lambing.

In the southern inland districts, therefore, the best time for putting rams and ewes together is in November or December, thus ensuring the drop at a time when in normal seasons good grass is available, which should continue in succulent condition until October or November.

This admits of a good margin of time for the sale of the lambs before they incur much risk of injury from grass seeds.

If the rams will not work when first run with the ewes the difficulty is usually soon removed by yarding them at night for a week or so.

It is best to sell lambs before the grass seed is ripe enough to shed, as they rapidly lose condition if affected by it. Should it for any reason be considered desirable to hold them over, the risk is greatly lessened by shearing them or by running them with their dams on land as free as possible from objectionable grasses.

Where rape or other cultivated pasture is provided for sheep the risk is removed.

As lambs are in their most saleable condition while receiving the benefit of their mother's milk, they should not be weaned before the time of sale, the effect of weaning being a loss of weight and the roundness and freshness of carcass, which are essential features.

The ewes which have given the most satisfactory results as dams are the first-cross Lincoln-Merino. They are roomy, and, therefore, the risk of loss at lambing time is far less than is the case with the pure merino. They may also be bred from at an earlier age than is advisable with the merino.

Two-tooths by Shropshire Ram from Lincoln-Merino Ewes.

Comparisons of risks in lambing have been carefully made and the results have shown that whilst the percentage of first-cross ewes assisted reached no higher than 4½, it was necessary to give help to 28 per cent. of large-framed merino ewes when lambing to rams of British breeds in a good season.

They are less nervous than the merino ewes, which is a great advantage, as when clearing stubbles or feeding off cultivated pastures the cross-breds will work close to the fences without taking alarm at passers by, thus avoiding much trampling of crops and running about to the detriment of themselves and their lambs.

Trials are now being made of ewes by Border-Leicester rams from merino ewes, the breed being of good size and attractive appearance.

In selecting rams for breeding cross-bred lambs for market, care should be taken to obtain only such as are pure-bred, as loss of time and disappointment will certainly follow the use of grade sires.

Such rams are purchased because they are offered at lower prices than those asked for pedigreed stock, and then the buyer blames the breed (of which he has never tried a pure representative) for failure to meet his expectations which have been founded on results obtained by others from the use of pure sires.

Short-legged blocky rams showing good width of hind quarters, standing on legs set wide apart and carrying meat well down to their hocks should be selected when mating for producing freezers.

It is not necessary that the farmer shall breed his own ewes, as it will be found more profitable to buy them as required from breeders on a large scale. If found desirable they may be fattened and sold after having reared their lambs.

Four-tooth Wethers by Shropshire Rams from Lincoln-Merino Ewes.

The following rams have been used at Wagga, viz.: Shropshire, Border-Leicester, Dorset Horn, Lincoln, Suffolk, Hampshire, and Cotswold, but some of them have had only a limited trial.

So far the results have been in favour of the progeny of the Shropshire rams from the Lincoln-merino ewes.

The stock resulting from this cross are very shapely animals, making very rapid growth, dressed weights of 40 to 50 lb. at 4 to 5 months being numerous, while the drop in all seasons has been of even character, very few lambs having to be rejected at sale time.

The wool has proved of fair quality and the quantity has been satisfactory, averages of 9 to 11¼ lb. having been obtained from a small flock of wethers, while lambs at 3 months have averaged in a good season 3¾ lb. from a flock numbering some hundreds.

Under adverse conditions their loss of weight has been less than that of any other cross-breeds, and their gain under hand-feeding in a season of drought has been greatest. In fact in one feeding test in which every other breed lost weight the Shropshire x Lincoln-merino showed a fair gain.

The Border-Leicester ram on the Lincoln-merino ewes has produced lambs of excellent type which slightly exceeded the Shropshire crosses in daily growth for the first four months. The risk in lambing to rams of this breed is somewhat less than in the case of any other cross, owing to the heads of the rams being smaller than others.

Further, the rams possess the advantage of having faces free from wool, and bellies comparatively lightly covered, both points being of especial value in grass pastures with ripening seeds.

The lambs, however, did not hold their condition so well as the first-mentioned cross, but in fair seasons they may be relied on to give excellent results.

In the past season the lambs by a Dorset Horn ram from Lincoln-merino ewes have surpassed all others in growth, and they give every indication of proving a valuable cross under our conditions.

During the drought of last year, although all sheep had to be hand-fed, the Dorset ram obtained the highest average of lambs, viz., 90 per cent. from seventy-five ewes.

Shropshire x Merino Lambs.

In order to relieve the ewes the second lamb of the twins born was killed, otherwise his average would have exceeded 100 per cent.

As some of the district averages were as low as 8 per cent., the farm general average marking of 75 per cent. must be regarded as satisfactory. Such results, however, are only obtainable by giving the ewes strict attention at lambing time, so that those in difficulty may be assisted, and the ravages of crows prevented.

Systematic baiting for dogs and foxes should be carried out. A good method is to run a drag round the paddocks consisting of a good-sized piece of flesh which has been slightly roasted. On the trail thus made pieces of meat, preferably liver, or birds which have been treated with strychnine should be dropped at intervals and all dead lambs should be treated with poison for the purpose of increasing the chances of a good catch.

It is claimed by some that foxes will not take baits which have been handled in their preparation but the contrary has been our experience.

Where sheep are kept on wheat farms—and no such farm should be without them—they should be turned on to stubble or fallowed land, as they perform valuable service in cleaning up fallen grain, and to some extent fertilising

Border-Leicester x Merino Lambs.

the soil, while at the same time they utilise weeds and other matter which would later become a source of trouble but for their agency. In cultivation paddocks it is of great advantage to sheep that shade be provided for them.

Second Cross Lambs—Border-Leicester on Lincoln-Merino.

When fertilisers are used for wheat and the land is later allowed to return to grass it will be found that cultivation has considerably increased its carrying capacity.

In a paddock of 300 acres which is alternately cropped and allowed to return to pasture, we have carried in a good season 1,400 sheep and lambs

for five months, and then so little effect was apparent on the pasture that a large quantity of it was cut for ensilage. It was only possible to operate on a limited area as the grasses and herbage ripened rapidly.

In a later year the pasture would have carried at least twelve sheep for four to five months of the growing season, but it was not possible to stock it fully.

In a paddock which had borne eight crops in ten years, two of which were fed off while green, we have fed within a fraction of four sheep per acre for five months, the effect on the pasture being hardly apparent.

Re-seeding has been carried out partly by the action of winds in carrying seed from surrounding paddocks, and partly from the grasses which will usually be found to some extent present in cropped land. A quantity of grass seed probably lies dormant until the land is freed from crops for a time.

As it is desirable in conjunction with lamb-raising to provide some cultivated pasture of a succulent nature, notes on rape and lucerne are appended.

Crops for Sheep.

Rape.

In conjunction with the raising of cereals, this crop will be found useful for rotation, the plants being deeply rooted and therefore of value in opening up and sweetening the subsoil. The preparation of the land for rape is of value in causing the germination of the seeds of weeds and such grain as may have been shed during the previous harvest, and there is thus provided a greater variety of pasture for stock, while at the same time the land is cleaned for succeeding crops.

If it be desired that rape should immediately follow a cereal crop, the land should be ploughed or otherwise broken immediately after the stubbles have been fed off by sheep.

In the drier districts the rotary disc plough will be found invaluable for the purpose, it being very thorough, expeditious, and economical in its work.

It can also be used in the summer, when work with mould-board ploughs is impracticable. The soil should be thoroughly pulverised and the surface made fairly even, as the seed is small and, therefore, it must only be covered lightly.

If sown broadcast it may be covered by harrowing lightly or by rolling. It may also be sown by means of the grass-box attachment of an ordinary wheat drill, the latter method having an advantage in the depositing of the manure with the seed and in slightly reducing the cost of seed.

The latter item, however, is inconsiderable, as the cost of seed rarely exceeds 4d. per pound, and a broadcast sowing of 3 lb. per acre is ample.

The best variety is the Dwarf Essex.

The best time for sowing is February or March, the former being preferable, as in the event of storm rains the growth, owing to the greater warmth of the soil, is very rapid. Still good results may be obtained by sowing as late as April, provided the crop is manured.

In all cases it will be found desirable to use about 50 lb. per acre of superphosphate, or, better still, one of the commercial manures containing a little potash and nitrogen in addition to the phosphoric acid contained in the ordinary superphosphates.

Should the crop get a good start in warm weather it should be fit for feeding off in eight or ten weeks. Care should, however, be taken that sheep are not left on the crop long enough to injure the crowns of the plants by close feeding. It is, therefore, advisable to have more than one paddock, so that the respective areas may be fed off in rotation, thus giving the earlier grazed area time to make fresh growth while those in later use are being fed off. Much greater value may thus be obtained than if the whole area be stocked at one time. In fair seasons good pasture may be obtained up to October or November. The plant being an annual, it seeds and dies in the latter month, unless killed earlier by stock.

Rape seed will germinate here freely in the spring, but the crop is very liable to be destroyed by aphides in the early stages of its growth, while the autumn-sown plants either do not attract the pest or are capable of resisting its attacks.

When first stocking rape with sheep care should be taken that they have been fairly well filled on some other pasture, so that the risk of hoven is decreased. After the first day the risk is comparatively slight, and the stock may be allowed to remain on the crop.

It is an advantage if the sheep can leave the crop for a sound camping ground, whence they may return to feed at will.

In districts favoured with a better rainfall than ours, records of the carrying capacity of crops of rape up to twenty sheep to the acre are available. Our best local record is the fattening of nine ewes and lambs per acre.

Lucerne.

Naturally the best situations for lucerne growing without irrigation are low-lying lands with a good depth of soil, and a possibility of the existence of water-bearing drifts at a fair depth.

As such conditions are not available on the majority of farms, the sites nearest approaching those described should be selected, as it will pay to have an area, however small it may be, under lucerne.

The best seed is that grown in the Hunter or Tamworth districts.

If sown through the grass-box of a wheat drill 4 lb. per acre of seed of the best quality will be sufficient, as the ground will be in the course of a few months fairly covered. If sown broadcast, 10 lb. per acre will be required under ordinary conditions, but in irrigated land it will be found desirable to sow not less than 15 lb. of seed per acre, as the increased quantity will check a tendency to produce too woody a growth.

The land should be subsoiled if the subsoil is not free enough to be easily penetrable by roots; but if it be of a free nature it may be ploughed as deeply as the soil will permit without bringing sour soil to the surface.

A fine, firm seed-bed should be prepared, as it is inadvisable to cover the seed very deeply, about an inch being the maximum.

Seed sown broadcast may be covered by lightly harrowing, or by rolling, according to the condition of the soil. If it be desired to use fertiliser with broadcast seed it should first be sown underground by means of the drill, as surface-sown manures in dry localities are comparatively ineffectual, and in some cases they are injurious as they attract the roots of the crop to the surface stratum.

The use of fertilisers is recommended in wheat land of the ordinary quality, as even a small quantity deposited with the seed is of great assistance to the young crop in its competition with weeds.

About 50 lb. of superphosphate drilled with the seed will be found to give very satisfactory results. The application of potash has, so far, proved unprofitable, but at some time in the future its application may become necessary.

Lucerne may be sown in two seasons, viz., autumn and spring. In the former, March and April are the best months, and in the latter season August and September will be found the best. Where irrigation is possible, however, the sowing season may be considerably extended.

As the autumn sown crop is usually more liable to suffer from competition with weeds which start with it, the spring is the most favoured sowing time inland, but, as already explained, the conditions may be greatly improved by the proper application of manure.

As the life of lucerne may be considerably prolonged by cutting it instead of feeding it off, it will be found desirable to use the mower, even though it may be necessary to allow the stock to pick it up after the cutting. Of course, as it is not always possible to obtain sufficient growth for cutting, there are times when it must be fed off as it is undesirable to allow the crop to run to seed.

In hot weather, when the growth is sufficiently strong, it may be harvested with the reaper and binder, as by this means the work can be much more cheaply carried out than is possible with the mower and horse rake. The hay is of the best quality, as if cut when in flower there is practically no loss of leaves, owing to the binding in sheaves, which does away with the necessity of handling it as is necessary when cut by the mower. The sheaves should be lightly stooked in rows, not more than two deep.

By cutting and storing the crop it may be saved for times of greater necessity than those existing when the crop is fit to cut.

As in the case of stocking rape, sheep should not be turned into a standing crop of lucerne when they are empty. When feeding off is necessary, it should be done as promptly as possible, and the sheep removed before they can injure the stools. The crop possesses its best feeding value when just at the flowering stage.

METEOROLOGICAL BUREAU, No. 4 DIVISION, NEW SOUTH WALES.

Weather Conditions during April, 1908.

S. WILSON,
Divisional Officer.

AT the beginning of the month an anticyclone was shown over the greater part of the southern half of Australia, and the rear isobar of another on the Queensland coast, between Townsville and Brisbane. Elsewhere on the mainland and over Tasmania, the weather was under low-pressure control. Steep gradients between Victoria and the east coast of Tasmania resulted in very strong westerly winds and rain squalls over that area, with rough seas in Bass' Straits. Fresh to strong easterly winds prevailed in Western Australia, the direction being governed by the presence of a low pressure on the coast, between Carnarvon and Geraldton. Some light to heavy rainfall occurred in the area occupied by the low pressures, but fine weather for the most part ruled over the country covered by the anticyclone. The heaviest rainfalls recorded were 280 points at Thursday Island and 252 points at Cooktown.

During the following twenty-four hours the anticyclone advanced in a north-easterly direction as far as our coastal districts, and covered the whole of New South Wales, Victoria, and South Australia, where fine weather resulted generally, with the exception of light showers here and there along the seaboard of Victoria. An Antarctic disturbance appeared over southern districts of West Australia, and caused thunderstorms and light rainfall there; whilst in the depression over northern Queensland Cooktown had another 201 points, and Mein 44 points.

The isobaric chart on the 4th showed an irregular-shaped high pressure over the south-eastern States, with its centre between southern Victoria and the west coast of Tasmania, and two depressions, an incipient one covering the northern portion and the other the south-western quadrant of West Australia, having its lowest readings in the south-west corner. This distribution of pressure was attended by sultry weather conditions in Northern and Western Australia, and light rainfall on the north coast of Queensland and at scattered places in the south-west corner of the continent, where fresh to strong north to north-west winds, with moderate to rough seas, obtained. Light rainfall was also reported from scattered places on the seaboard of New South Wales, south from Port Macquarie with the exception of an isolated heavy fall of 162 points at Camden Haven. By the 6th, the central readings of the anticyclone had increased by three-tenths inch along our coastline and the south-east of Tasmania, the innermost isobar attaining the value of 30·4 inches. Its outer isobars, which had arranged themselves horizontally, now covered the greater part of the continent, and controlled south-east to north-east winds throughout. The West Australian

"low" had surged southward. Light to heavy rainfall was reported from scattered places, and slight to rough seas along the southern and south-eastern shores of Australia. The heaviest falls occurred on the north coast of New South Wales. Clarence Heads had 225 points; Byron Bay, 198; Lismore, 175; Tweed Heads, 170; and Camden Haven, 162 points. The remaining falls in our State were mostly under 100 points. The heaviest reported rainfall in the other States was 125 points at Thursday Island.

On the 7th the centre of the high pressure experienced a slight retrogressive movement, and its longer axis assumed a north to southerly direction. The "low" which was over West Australia on the 4th reappeared in the Great Australian Bight, south of Esperance and Eucla, where it caused moderate to rough seas. Weather conditions intensified along the eastern shores of the continent and over West Australia, resulting in further rainfall there. The heaviest fall was reported from Balladonia, with 138 points; Mackay, in Queensland, had 66 points, and Rockhampton 50 points. In New South Wales the rain was confined to the seaboard north from Manning Heads. On the 8th but little change was shown in pressure distribution, excepting that the isobars on the Queensland coast were somewhat congested, and the frontal portion of another anticyclone appeared in the south-west corner of the continent. The rainfall in West Australia still persisted, light to heavy falls being recorded there. Mackay, on the coast of Queensland, reported another 650 points; but the other falls in that State were only light to moderate, and scattered over the eastern districts. Light rain was also recorded along the coast of Tasmania, and additional light to moderate falls occurred on the north coast of New South Wales.

At 9 a.m. on the 9th, the anticyclone which had constituted the chief weather control of the continent since the 6th now showed evidence of diminishing energy, for the pressure value of its centre had suffered a loss of two-tenths. The "Antarctic low" was still located on the shores of the Great Bight, and the new "high" in West Australia had gained an additional isobar. Rain continued on the coast of Queensland, and the heaviest again occurred at Mackay, with 275 points. In West Australia the rain area had contracted to the southern districts, and an isolated fall of 14 points was reported from Hythe, in Tasmania. The rainfall in New South Wales was confined to the North Coastal and Tableland districts.

On the 10th, the "Antarctic low" was shown on the east coast of Tasmania, having travelled over 1,200 miles during the preceding twenty-four hours, which represents about three times the normal rate; and the advance isobars of the "high" over West Australia had shot forward to the western districts of Victoria. The rainfall with this distribution of atmospheric pressure was confined to practically the same area as on the previous day.

The temperature in New South Wales during the past week was mild, the highest barely exceeding 90 degrees, whilst the lowest registration was 25 degrees at Kiandra.

On the 11th, portions of two anticyclones were shown over the southern half of Australia, whilst an incipient "low" covered northern parts. Light

to heavy rainfall occurred along the Queensland seaboard, and very light at scattered places along the southern shores of Australia. The heaviest fall reported was 201 points at Mein. Within the following forty-eight hours light to heavy amounts were recorded at many places over the eastern half of New South Wales. Bungendore had 276 points, Coonabarabran 240, Carinda 218, Millie 198, Junee 178, Wee Waa 152, Quambone 134, Gundagai 114, and Cassilis 113 points.

At 9 a.m. on the 13th, the south-western and south-eastern corners of the continent were covered by portions of the high pressures, otherwise its weather was dominated by a monsoonal depression which had extended as far southwards as Broken Hill. Sultry conditions obtained over Northern Australia, and scattered light to moderate rainfall occurred in various districts. In New South Wales only two places reported rain, viz., Newcastle 13 points, and Maitland 9 points.

During the following twenty-four hours, monsoonal influence expanded, and the unsettled rainy conditions intensified over the northern half of Australia, resulting in some good light to heavy falls. Powell's Creek had 102 points, Camoweal 71, Windorah 52, and Daly Waters 50 points.

In New South Wales, light to heavy rainfall occurred over the north-west quadrant and central districts, and extended as far eastward as the coast at Sydney and Jervis Bay. A few places in the north-east corner also reported rainfall. The heaviest falls were 110 points at Tilpa, 107 at Tibooburra, 65 each at Hungerford, Cobar, and Byron Bay, 62 at Louth, and 61 at Milparinka; otherwise the amounts were under 50 points.

On the 15th, with the disturbance in practically the same position, further rain, associated with thunderstorms, was recorded over many parts of Australia. In South Australia splendid rains occurred generally, excepting west of Lake Eyre. Over New South Wales, with the exception of the north-east quadrant, good rainfall was recorded generally. Five stations reported falls of 1 inch and over. The high pressure over West Australia gained in energy during the following twenty-four hours, and its outer isobars advanced eastward at an unusually rapid rate and considerably lessened their distance from the "high" over Queensland and north-east districts of New South Wales. The monsoonal disturbance which had hitherto occupied a position over Central Australia was now severed and displaced, one portion having retreated as far north as the Gulf of Carpentaria, and the other to our south-eastern districts, where, on the 17th (Good Friday), it developed into a cyclonic storm of considerable energy, causing strong east to southerly gales, heavy rains, and rough to high seas on the coast.

At 9 a.m. on Saturday, the 18th, an energetic anticyclone was shown covering the greater part of Australia, with its centre—30·4 inches—located in Tasmania, whilst over the eastern States was a monsoonal depression. Steep gradients in the south-eastern corner of the continent resulted in more severe gales and rough seas along that portion of the seaboard. Rainfall was reported from many districts in the interior, and on coastal districts of Australia. Light to heavy falls occurred generally in Central and Southern

Australia, as also in New South Wales and parts of Queensland. The largest amounts in our State were recorded on the South Coast and tablelands, although good falls occurred in other parts. Bateman's Bay had 532 points, Ulladulla 437, Moruya 405, Araluen 309, Bega 242, Bemboka 238, and many others approached or exceeded 100 points. The heaviest in the metropolitan area were—Turramurra 280, Glebe Point 214, Riverview 177, and Sydney 150 points.

During the following forty-eight hours, a great change occurred in pressure distribution; the barometers in Tasmania had suffered a fall of between one-half and three-quarters of an inch, and the centre of a high pressure appeared in the south-west corner of the continent. The rain area had contracted considerably in the several States, although some good falls were recorded over the eastern districts of New South Wales. Pambula had 194 points, Casino 165, Byron Bay, 150, Yetman 152, Uralla 148, Wollongong 144, Crookhaven 141, Mullumbimby 130, and Clarence Heads 120 points; the remaining amounts ranged from 3 to slightly over 100 points.

Between the 21st and 24th, the weather of the main portion of the continent was controlled by the anticyclone which had gradually increased in energy until the 23rd and 24th, when the value of its central isobar reached 30.5 inches, between Eucla and Adelaide. Some further light to heavy rainfall was reported from coastal and tableland districts of New South Wales, Camden Haven with 203, and Port Stephens with 110 points being the heaviest.

Temperature for the most part was cool, the highest during the week ended the 24th being 86 degrees at Moree, and the lowest 21 degrees at Kiandra.

On the 25th, a high pressure covered the southern half of Australia, with its centre—30.5 inches—running along the seaboard from Albany to Cape Borda. The northern districts of the continent were under low pressure control, and a slight monsoonal depression was shown over eastern Queensland. Congested isobars along parts of the western and southern coast-line were responsible for local strong winds and rough seas. Light to heavy rainfall was reported from various districts of West Australia, and from scattered places on the coast of the eastern States

Within the next forty-eight hours, the centre of the high pressure contracted to about Adelaide and Robe, and the main body of it had wheeled north-eastward displacing the depression from Central to Northern Queensland; but the disturbance over North-western Australia intensified its central readings, having diminished by nearly two-tenths inch. At 9 a.m. on Monday, fine weather ruled over the greater part of the eastern half of Australia, with frosts at places on the highlands, and in the South Coast district of our State. But prior that, on the 25th and 26th—rainfall occurred almost generally along the coast of New South Wales, and at a few scattered stations in the north-eastern quadrant. The heaviest falls were—195 points at Byron Bay, 140 at Raymond Terrace, 137 at Newcastle, and 112 at Port Stephens. Some light rain was also registered along the coast of Queensland. Very heavy falls, destructive winds, and rough seas,

were experienced in and adjacent to the area covered by the centre of the disturbance in the north-west corner of the continent. Broome had 766 points, Lagrange Bay 425, Onslow 189, and Derby 112 points; otherwise the rain in the western State was light to moderate in character.

On Tuesday, the 28th; although covering practically the same area as on the previous day, the anticyclone had lost upwards of two-tenths inch in the value of its centre isobar. But the disturbance in West Australia had extended southwards throughout that State, resulting in general rainfall over the interior and South Coast districts. The heaviest falls were—187 points at Derby, 121 at Wiluna, 95 at Kalgoorlie, and 83 points at Menzies. Cloud areas also formed over the centre and in the south-east corner of the continent, and light to heavy rain was reported from the Hunter and Manning District, as also from one or two places in the metropolitan area, Port Stephens with 127 points being the heaviest.

At 9 a.m. on the 29th the centre of the high pressure was shown over Victoria and the south-eastern half of New South Wales, having diminished considerably in area; but its outermost isobar had extended westward to the Coolgardie Goldfields and displaced the depression there. Further rainfall was recorded at scattered places in the interior of West Australia, and here and there along the seaboard of the continent. The heaviest occurred on our extreme North Coast, where Byron Bay had 252 points and Mullumbimby 115 points. Fog was also reported from scattered places on the highlands of New South Wales, but elsewhere, excepting for a few scattered cloud areas, the weather was fine generally.

On the last day of the month the anticylone was situated over the eastern half of Australia, its centre—30·3 inches, located off the south-east corner—having been reduced considerably in dimensions. Relatively low and flat barometric conditions obtained over the western half of the continent, and an "Antarctic disturbance" was shown in the south-west corner, where it caused more light rainfall and moderate to rough seas. Light to moderate falls were also recorded at scattered places in the north-eastern quadrant of New South Wales, with the exception of an isolated heavy one at Clarence Heads, registering 103 points. Little or no rain was reported from Victoria, but many frosts were experienced during the early morning.

Temperature over our State during the week ended the 30th was, for the most part, cool to mild; the lowest occurred at Kiandra, with 22 degrees, on the 27th. Other places with registrations below freezing point were—Nimitybelle, 28 degrees; Walcha, Rockley, and Orange, each 29 degrees; Braidwood, Bowral, Carcoar, and Mudgee, each 30 degrees; and Cooma, Coonabarabran, and Molong, each 31 degrees.

Taken as a whole, the character of the rainfall during the month just ended may be classed as patchy and, for the most part, discrepant, the preponderance of totals which were above normal being confined chiefly to northern districts of the State. But even there, between areas showing excesses as compared with the normal, there were large tracts of country in which the amounts were in defect. In the Metropolitan District, Central Tableland,

and Riverina not one station had rainfall in excess of the normal. The largest totals were recorded at scattered places on the coast; Byron Bay had 1,059 points, Camden Haven 755, Clarence Heads 704, Bodalla 633, Bateman's Bay 612, Ulladulla 557, and Port Stephens 517 points.

The distribution over the various subdivisions of the State during April, 1908, was as follows:—

		Departure from normal. Points. Above.		Below.
North Coast	from	544	to	238
Hunter and Manning	,,	282	to	364
Metropolitan	,,	—		143 to 250
South Coast	,,	338	to	379
Northern Tableland	,,	87	to	53
Central Tableland	,,	—		1 to 177
Southern Tableland	,,	236	to	279
North-western Slope	,,	171	to	118
Central-western Slope	,,	23	to	150
South-western Slope	,,	97	to	146
North-western Plain	,,	273	to	43
Central-western Plain	,,	142	to	112
Riverina	,,	—		13 to 129
Western Division	,,	107	to	100

Comparison with India.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia as far as data are available, for the month of April, 1908:—

	Departure from normal. Pressure.	Departure from normal. Temperature.	General Conditions (referring to State as a whole).
	inches	degrees.	
India	- ·03	+ 1·9	Normal.
Sydney (N.S.W.) ..	+ ·08	- 0·2	Scattered areas above normal in northern parts, Southern Tableland, and South Coast Districts; otherwise below.
Melbourne (Victoria)	+ ·16	- 0·4	Very dry.
Perth (W.A.) ...	+ ·02	- 0·5	Below normal in the South-west and Gascoigne Districts; elsewhere greatly above.
Adelaide (S.A.) ..	+ 05	+ 1·0	Below.

In the above table, India alone is shown to have had temperature in excess of the normal and pressure in defect, and Adelaide with both elements in excess. The other Australian capitals, on the contrary, all had temperatures in defect and pressure in excess. Melbourne's mean barometric pressure for the month was sixteen-hundredths inch above average, and temperature in India and Adelaide 1·9 and 1·0 degrees above normal respectively.

Victoria, during April, was the driest of all, not one station having rainfall above the av rage. South Australia, also, was below normal. In New South Wales, although scattered areas, principally in northern parts, had falls in excess of the normal, yet, judged as a whole, precipitation was somewhat less than the average for the month. The rainfall in West Australia was, for the most part, greatly above, excepting in the south-west and Gascoigne, where the amounts received were below the normal.

Entomological Notes.

WM. B. GURNEY,
Assistant Entomologist.

Beetles Attacking Furniture and Woodwork.

Reports having been received during the past few months of furniture and woodwork having been attacked by beetles, some methods of treatment recommended are given below. After furniture has been made up, frequently tiny holes appear, while small piles of wood dust may be seen below. A common cause of this is the grubs and adult beetles of *Lyctus brunneus* (Fig. 1). Similar attacks by beetles of the genus *Anobium* are made in furniture, wainscoting, &c., and the following methods of treatment, to be applied according to circumstances, are given:—

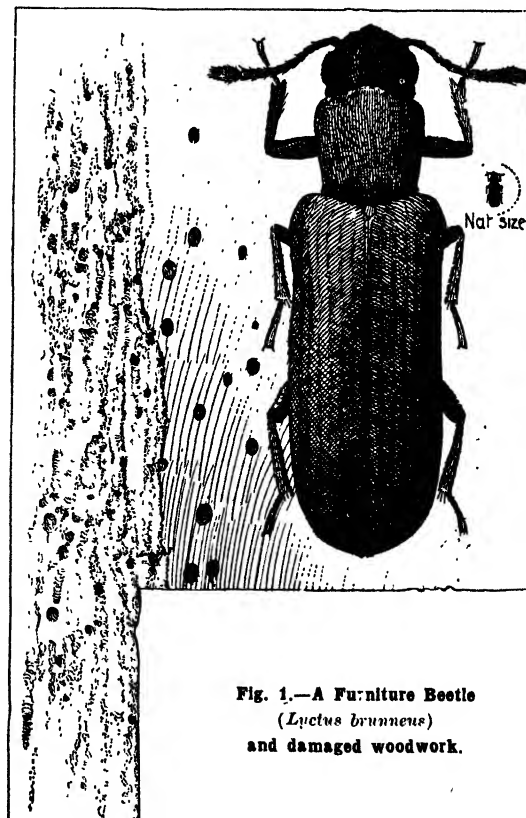


Fig. 1.—A Furniture Beetle (*Lyctus brunneus*) and damaged woodwork.

Benzine, or benzine and carbolic acid mixed, painted on the surface (polished surfaces treated will be spoilt, and need repolishing).

Chairs and such small articles may be enclosed and fumigated with hydrocyanic acid gas. The inside of wardrobes, or even entire rooms, may also be fumigated with this gas, which will destroy numbers of the beetles. The gas is a deadly poison, and requires careful use.

Painting flooring boards and woodwork affected with a corrosive sublimate or arsenic solution is recommended to poison the beetles boring into or out through the surface of the woodwork. (One ounce corrosive sublimate dissolved in a pint of methylated spirits and mixed with about 5 gallons of water—care must be taken in the actual handling of this poisonous solution; or ½ lb. white arsenic, 1 lb. washing soda, in 8 or 10 gallons water.)

The Furniture Beetles of the genus *Anobium* are sometimes known as "Death Watches," owing to the ticking sounds made by tapping their heads against the wood. Both *Anobium* and *Lyctus* attack cane and rattan furniture. Chairs and baskets mightbe treated by dipping them into boiling water, the heat destroying the grubs and beetles where the frame-work is not too thick.

PEA AND BEAN WEEVILS.

The grubs and adult beetles of several species of the genus *Bruchus* commonly attack various pea and bean seeds in store. The cowpea weevil, *Bruchus chinensis*, the common bean weevil, *B. obtectus*, and another species are recorded doing damage in New South Wales. Some imported Hindoo peas called "Mungi" were found to be infected with *B. chinensis* at Ballina recently. Some cowpea seed from Wagga has been infested for the past eleven months with a reddish *Bruchus* Sp. with four black spots on the elytra, resembling *B. quadrimaculatus*. This occurs when the temperature is not low. These beetles have bred and increased and riddled the seed badly. This same species has now been sent to me by Mr. Steel of the Colonial Sugar Refining Co. (Ltd.), Sydney, with the report that it is in some Delhi gram recently imported into Fiji. For destroying these pests, which are the cause of the loss of a large percentage of stored seed, fumigation with carbon bisulphide is best. The seed is placed either loose or in bags in some fairly-tight box or other receptacle, and the charge poured into the top of each bag, either on some cotton waste or directly on to the seed.

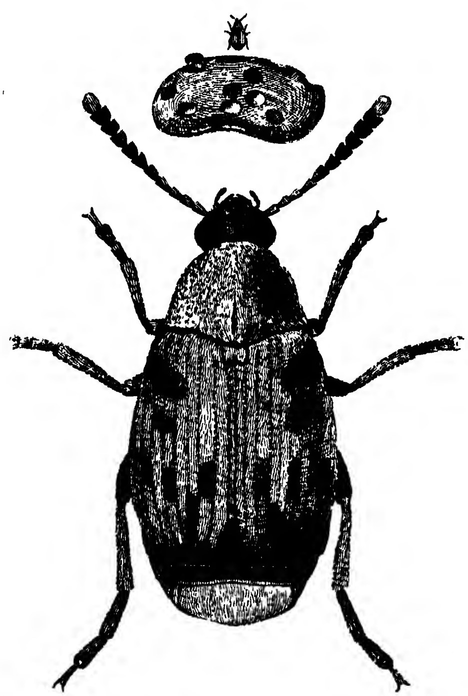


Fig. 2.—Bean Weevil (*Bruchus obtectus*).

The heavy fumes sink amongst the seeds, destroying the beetles and the grubs, even those within the seeds. 1 lb. to every 100 bushels, left for twenty-four hours, is said to be effective.

A stronger charge, say 1 oz. to a bushel, is recommended to ensure better results, or where the seed receptacles are not close fitting, or when the seed is to be left only ten or twelve hours. Neither the fumes or liquid as used will affect the germinating quality of the seeds. The fumes are highly inflammable, and no lights should be allowed near.

Mr. Chilton, Belmore Markets, Sydney, who used carbon bisulphide as recommended with success, also found cold storage effective. Cowpea seed was kept in cold storage (35° F.) from August till December, 1907, and, though infected, the weevil was found not to have developed The seed planted in December yielded a good crop, and seemed, evidently, not affected by the cold. This method destroys the grubs and beetles, and, if it does not destroy the eggs, prevents their development, and the method of cold storage can be recommended to save a large percentage of grain otherwise lost owing to these beetles.

APHIS CAUSING SCAB ON SHEEP, CATTLE, AND HORSES.

From time to time reports have been received by the Entomological Branch of aphis said to attack white-skinned sheep, horses, and cattle. No specimens actually from the affected animals have been received, though it is thought the clover aphis is the cause, as this is always present on the trefoil or swarming in the air at the time the damage commences White-skinned animals or the white-skinned patches on dark-skinned animals are alone reported to be affected, and sheep just off shears are particularly subject to attack. For this reason white patches are often discoloured by paint, &c., as protection.

Through the kindness of Messrs. Wm. Cooper and Nephews, Sydney, Mr. R. C. Timson, of that firm, procured for me some clover aphis and a damaged sheepskin. Figure 3 shows a photograph, about natural size, of a small portion of this affected skin. The wool is permanently destroyed, and a rough yellowish scab, consisting of thick irregular scales, is formed, suggestive of the work of a scab mite. Large irregular patches of this scab, from several inches up to 2 feet or more in length are often formed on the bodies of the sheep.

Mr. Timson reports: "Clouds of these clover aphis will be noticed in spring, the touch of which are irritating and a nuisance while travelling The first attack on the animal is not noticeable, but in a few days irritation of the skin sets up, accompanied by exudation of a sort of mucus . . . and after all trace of insect life has been removed the sore remains active for months at a time . . . and the wool never grows again—at any rate, in a healthy condition. The trouble is looked upon as serious where it exists."

The exceptional habit of a vegetable-sucking insect attacking animals is curious, and, should the pest appear next season, a study will be made of how, if it does, it causes the irritation. A tobacco and soap wash, and various dips, would readily destroy aphis on the animals, though they may not prevent reinfection from the aphis, except, perhaps, where, as considered by some, the discolouration due to the dip protects them from further attacks. We would, therefore, be glad to receive word in the event of the pest reappearing, that investigation as to the cause and an effective remedy may be made.

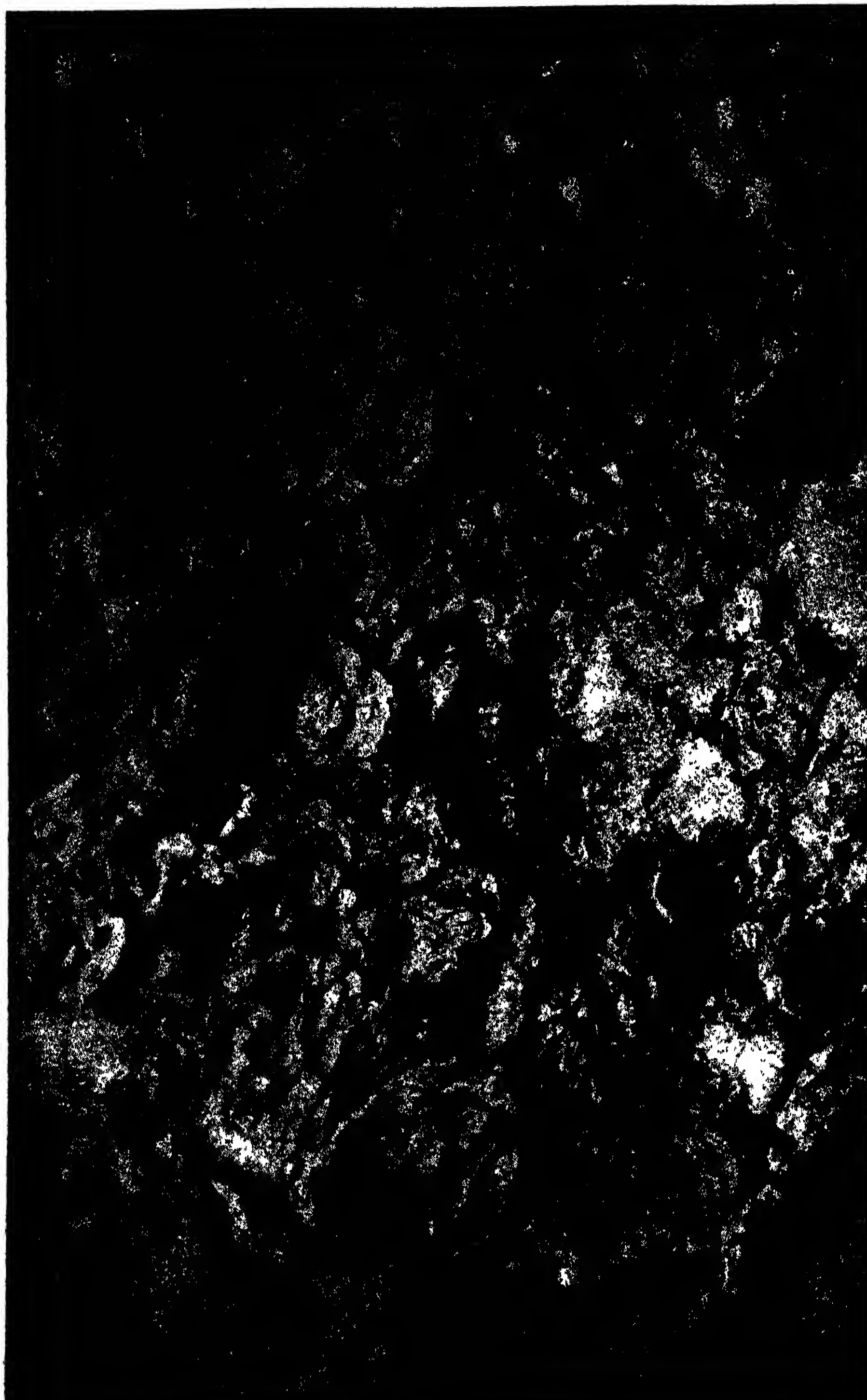


Fig. 8.—Sheepskin, showing scab said to be due to aphis.

Report on Beetles from the Solomon Islands attacking Coco-nut Palms.

The beetles forwarded proved to be *Xylotrupes gideon*, and a variety with shorter horns, viz., *Xylotrupes gideon* var. *oromedon* (family Scarabaeidæ). The male possesses large horns projecting from the head and thorax, which projections are not present in the female.

This species is found in the Pacific and East Indian Islands and China, and is closely allied to a Queensland beetle (*Xylotrupes australicus*), the grub of which sometimes attacks sugar-cane roots.

Among the specimens sent were also a few of the genus *Oryctes*, in which the thorax is much sunken. This species is allied to *Oryctes rhinoceros*, reported as a similar pest of date, coco-nut, and Palmyra palms in India.

The habits and life history of *Xylotrupes* and *Oryctes* are similar; the eggs are laid in rotten trees or decaying vegetable matter, and the grubs feed thereon, or on roots for a period of about two years. The grub is white, thick, fleshy, and curved, with a dark-brown head, and grows to a length of 2 inches or more. At night the adult beetle, which, though heavy-bodied, can fly, settles on the crown of a palm, and burrows down through the folded leaves to the heart of the growing shoot, decay sets up, and eggs may be laid in these burrows, and the grubs continue the damage of the adult. Without seeing the beetles at work in the plantations, the nature of the trees, and the surrounding forest, it is difficult to suggest what might be practicable and effective as a remedy.

The first necessity seems to be destroying all decaying palms and heaps of rotting vegetable matter likely to harbour the beetles or their larvæ, which may be in or about the plantations.

Spraying with a strong tobacco and soap wash may have a deterrent effect, as well as penetrating the burrows and destroying the grubs within; similarly, arsenate of lead (1 lb. in 50 gallons of water, or stronger) might be tried to poison the outer surface of the crown. Such sprays can be applied by barrel pumps and hose and nozzles; in the case of older plantations, bamboo poles or ladders could be used to raise the nozzles. After rain, the spraying would need to be repeated. The beetles are attracted by lights at night, and lights placed above trays of kerosene may attract and destroy numbers, especially on warm and cloudy nights.

Some few heaps of rotting matter or trees might be effective if left as traps for the eggs and grubs, and destroyed at regular intervals of a few months.

Seasonable Notes.

GEO. L. SUTTON.
Wheat Experimentalist.

Farmers' Experiments.

FARMERS responded heartily to the announcement in the March issue of this *Gazette,* inviting them to conduct trials with new wheats. More applications were received than could be supplied from the stocks of seed reserved for this purpose, so that those who omitted to apply early could not obtain the seed they desired.

Over 2 tons of seed have been distributed to seventy-two farmers, who are conducting the experiments in different parts of the States. Most districts are represented, from the coast in the east to Balranald in the west, and from Inverell in the north to Corowa in the south.

From the planting particulars to hand, very little difficulty seems to have been experienced by the experimenters in carrying out the directions forwarded with the seed. In a few cases, the object of having check plots has not been fully understood, and, in consequence, some of those who decided to sow according to either Plan No. 1 or No. 2, as being better than No. 3, have planted a *different* variety in *each* check plot, instead of planting the *same* variety in *all* the check plots. The experiment in these cases is not rendered valueless, but the Experimenter's intention to adopt the best plan is frustrated, because planting a different variety in each check plot reduces the value of the best plan to that of the least desirable.

The object of having check plots is to have a common standard with which all the other plots can be compared; in other words, the check plots can be used as a 2-foot rule, by which the value of the plots near or adjacent to it can be measured. This measuring is the more reliably and easily performed the nearer the check plots are to each other.

In field experiment work, to obtain the most reliable results, through minimising variations which are always present and which cannot be obviated, plots to be compared with each other should be adjacent plots; but this, in most cases, is impossible, and so the next best plan, viz., that of having a series of check plots, each of which is treated (as far as it is possible to do so) in precisely the same way, and with which each of the other plots can be compared, is adopted.

Though the value of check plots may not be apparent to those conducting an experiment for the first time, it is certain that the majority of observant farmers will be fully seized with their importance, and the vital necessity for them, before their experiments are concluded.

Macaroni Wheats.

Further evidence of the drought-resisting character of the macaroni wheats is furnished by a correspondent from Parkes, who writes as follows with reference to a wheat sent for identification, and which proved to be the macaroni variety Medeah:—"I found a few heads in the crop in 1902, and have sown it every year since. I find it is very prolific and stands drought well, especially the hot dry winds in October, when it is ripening." A statement like this, supported by similar ones in the past, leaves no doubt as to the value of macaroni wheats for dry conditions. For various reasons these wheats have not appealed to our farmers as they did to the farmers of the arid districts of the United States of America.

Whilst being drought resistant and suitable for ensilage, they are unsuitable for hay, because of their stiff, harsh beards, which also add to the difficulty of harvesting the grain when ripe. These features considerably lessen the value for our conditions. Chiefly because of these defects, combined with the possibility of producing a macaroni variety without beards, the cultivation of these bearded macaroni varieties has not been pushed as actively as it otherwise would have been.

Next season it is expected that a limited quantity of a beardless variety (possibly two or three varieties) will be available for distribution amongst farmers. The result of trials with these is awaited with great interest, in order that it may be seen whether the good qualities of this class—the chief of which to us is superior drought resistance—have been retained during the process of eliminating the undesirable ones.

Smut in Wheat.

From inquiries received, it is evident that there are some who still believe that steeping wheat in strong brine is a preventive of smut. It is known that seed so treated has often produced crops free from smut; but there must have been some cause for freedom from smut other than steeping the seed in brine, for Mr. McAlpine, Pathologist to the Victorian Department of Agriculture, has tried it without success at Port Fairy.

Steeping in brine is useful if the method adopted is such as affords an opportunity to remove unbroken smut balls, oats, chaff, &c. The removal of the unbroken smut balls is the only factor connected with this treatment which will assist in preventing smut, and in this respect it has no advantage whatever over steeping in a bluestone solution, and which, in addition, destroys the microscopic spores adhering to the grain; whereas the utmost effect the brine can have in this direction is the mechanical one of washing some of the spores off the grain.

Instances are still occasionally reported in which the bluestone treatment has failed to act as a preventive of smut. On investigating these cases, it is invariably found that failure is due through neglect to remove the unbroken smut balls when treating the wheat. The great necessity for treating the seed in such a way that these smut balls can be skimmed off as they float on the surface of the solution is apparent to any intelligent man who considers that in an unbroken bunt ball no larger than a wheat grain there are about 4,000,000 spores, or more than enough to infect, if evenly distributed, every grain in 4 bushels of wheat.

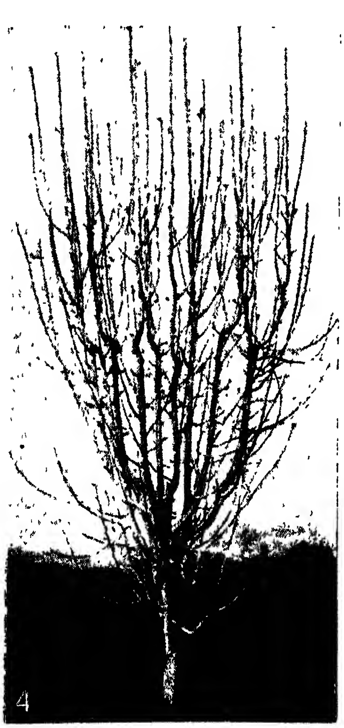
Orchard Notes.

W. J. ALLEN.

JUNE.

Planting.—Where deciduous fruit-trees or vines are to be planted this season, it is best to start the work as early as possible, whether it be for refills in an established orchard, or the planting of a new orchard. The sooner now that any planting is finished the better will be the early root growth, as the roots start to throw out new growth in July. If the soil is dry, however, it would be better to defer the planting until after more rain falls, but wherever there is sufficient moisture this work should be pushed on to completion.

Plant only such varieties as have proved themselves suitable to the district, and only plant a few varieties. Wherever there are old growers in the district it is well to be guided by them as to which they consider the best kinds of fruits to plant, then choose the very best varieties of the respective kinds, as it is only the high-grade fruit which is worth growing.



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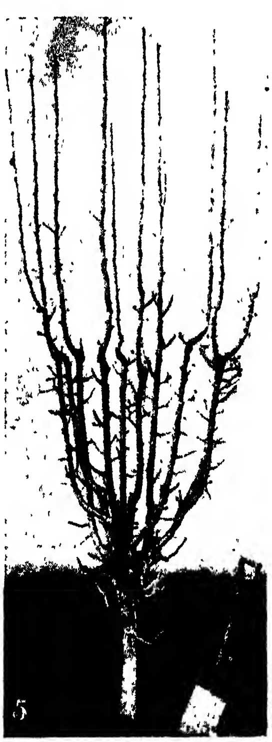
Kieffer's Hybrid Pear-tree, before pruning.



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The same tree pruned, with the exception of shortening back the leaders.

Pruning.—This work may be pushed on with as fast as possible now, as this and next month is the best time to prune all deciduous trees and vines. During the first few years after the trees are planted, see that they are given a heavy pruning, removing the central branches, so as to leave the centre of the tree quite open, in order that the middle as well as the outside, and the bottom as well as the top, have plenty of room and light to develop good fruiting wood in every portion of the tree. If this system of pruning is followed, the weight of the fruit, when the tree begins bearing, is borne by strong sturdy branches, which will not swing and bend with every breeze that blows.

Bearing-wood.—Good fruit develops on good bearing-wood, and good bearing-wood is the product of proper degrees of light and heat, as has just been urged; but bearing-wood in the case of some fruits is new wood, and reduction of old wood for the purpose of forcing the growth of new wood must be constantly borne in mind. Renewal is more or less a consideration with all trees, and especially the securing of strong new wood. This is a point upon which close study of the bearing tree will yield most satisfactory suggestions.

The same tree as it looks when finished.

The same tree a few months later, carrying fruit.

Pruning to obtain a low head.—It is as well to begin with the tree from the very start, which is at the time when it is transplanted from the nursery to the orchard, as a good beginning is half the battle.

Assuming that a tree is about to be planted out, the first thing to do is to examine the roots carefully to ascertain how they have fared in their removal from the nursery, as in this country, where proper tree-lifters or diggers are seldom used, it is frequently found that the roots have been badly mutilated. Before planting, all roots which have been broken or damaged should be cut away, and all the young roots cut back to within 6 or 8 inches of the

tap-root. All small roots may be removed, leaving only the larger ones, as on digging up a tree which has been planted for some time, it will be found, except in very rare cases, that the very small roots never throw out any young rootlets, but wither away and die, becoming a hiding-place, perhaps, for white ants, which often, in time, through such medium, take possession of the tree and cause its ultimate death. The roots should be cut with a sharp knife, and in such manner that when the tree is planted the cut will face downwards. By cutting this way, new roots which will form, or, rather, grow from the cut, will have a tendency to grow in the right direction, downward.

The next step to consider is as to how the top of the tree shall be dealt with. This, of course, will depend largely on the age of the tree in question. If a two or three year-old nursery tree, it may be advisable to leave either three or four short arms, as it is found that if the head is cut away and only a straight trunk left, the top of the tree may not shoot, but will die, and the tree shoot from the root. This is often the case with the peach, but where a few shoots are left this danger is avoided. If a well-grown yearling tree, I would prefer cutting it back to a single stem. It must be borne in mind always that in moving a tree it loses the greater portion of its roots, and that, in consequence, the remaining roots are unable to sufficiently support or nourish the growth above ground, for which the whole root system was intended. We must, therefore, shorten the top in such a way as to re-establish the lost equilibrium, and the planter must bear in mind that it is always better to cut a newly-planted tree back rather severely than to leave it with too much top, as by so doing it will recover more quickly, and in the end, make a much better tree.

Fruit-fly.—In one or two districts there are still evidences of this pest, but owing to the rigid inspection and the compulsory destruction of all fallen and infested fruits, the damage caused by this enemy is greatly reduced. In fact, in my opinion, the fruit-grower has a much more hardy enemy to fight in the codling moth than in the fruit-fly. In one of our orchards this year, where we have done everything that is possible to keep the moth in check, we have had to boil a thousand cases of fruit, which, had they been sound, would have easily sold at 7s. 6d per case. Where is there an orchard of 25 acres, in even the worst district, that has lost anything like a quarter of that through the ravages of fruit-fly?

Vegetation Diseases Act.—Such an Act exists in nearly all the States of the Commonwealth, but there is no other State which is striving to live up to the conditions of the Act to the same extent as we are doing in New South Wales. We have at least five qualified inspectors (who are also practical fruit-growers) to every one in almost any other State. These are appointed to see that fruit-growers are following out the conditions of the Act, and, in the course of their visits, are able to disseminate much useful information among the growers, who are doing their best to keep orchard pests in check, and while this nor any other State cannot totally eradicate these diseases, we hope to reach to as near a state of freedom from pests as it is possible to attain.

Farm Notes.

Hawkesbury District—June.

H. W. POTTS.

The winter season may fairly be estimated as upon us this month. Frosts arrived last month earlier than last year, and have rendered operations in connection with ensilage-making more urgent. The maize crops suffered in this regard. As usual, sorghums proved hardier and more suitable for late conservation as ensilage.

The summer rains and those again at Easter provided us with a good growth of couch, and all the paddocks provide enough fodder for stock. In addition this season, early cuttings of Skinless barley, also rape and turnips, are available.

We have not entered the winter with better provision for stock for many years past, although rain is again required. Last month was fully occupied in sowing the main crops of cereals.

Wheats.—The final crops for the season may be put in during the early part of the month, and the varieties best suited are John Brown, Marshall's No. 3, Plover, Upper Cut, Warren, and White Loaf for greenstuff. Medeah and Cretan macaroni wheats are very rust-resistant, and should provide useful green fodder to cut for late winter or for ensilage, and then allowed to mature as a grain crop for milling or poultry feed. Unless cut back or eaten off in the winter, the tendency of these wheats is to grow rank and produce a thick crop of straw. This makes it difficult and costly to deal with when thrashing.

Oats.—The best variety for hay is Algerian. In this district Red Rust-proof gives good returns. These main crops should be sown now. Coarser-growing sorts for green feed or ensilage are White Tartarian, Tartar King, Peerless White Bonanza, Abundance, Danish Island, and Potato. The last-named becomes easily discoloured with rain, and turns yellow rapidly after flowering. These points are not favourable for hay.

Barleys.—Further sowings of Cape and Skinless barleys may be made now. The latter not only affords a nutritious green stuff, but may be converted into good hay. The Cape variety is the hardier.

Rye.—The outlook at present points to a dry winter, and in that case it will be good practice to provide. Sow further crops of this hardy plant. It resists dry conditions and affords a useful green crop. White and Thousand-fold are the best sorts for grain, and Emerald for grazing or hay.

Turnips, Swedes, Field Cabbage, Kale, Kohl-Rabi, and Tree Kale.—Thin the rows freely, and keep up thorough cultivation. Small sowings of field cabbage, kale, and turnips may be made, in order to maintain a supply of stock feed for the spring.

Vetches, Peas, Beans.—The final sowings of vetches, alone or with oats or barley, can be made in order to provide early spring green feed for stock. Field peas and beans are also crops worth paying some attention to.

Onions.—Plant out the young seedlings into well-drained, mellow, rich soil. This plant needs good soil, failing which it will be essential to enrich it with farmyard manure or artificial fertilisers.

Rape.—This crop may be classed as a fodder for stock in close line with lucerne from a nutrient point of view. As a catch-crop in the rotation it is most valuable, and where sheep or pigs are reared no better or cheaper form of enriching impoverished soils can be adopted, more especially where the land is to be subsequently utilised for maize.

The plant is succulent, relishable, and rich in those elements for forming flesh. Moreover, it is a quick grower, and does not interfere with the main crops.

Further sowings should be made now in order to provide a grazing crop in September.

Glen Innes District—June.

R. H. GENNYS.

Tillage of the Soil.

One of the most important of farm operations is the preparation of the soil for farm crops. In its natural state the ground is generally covered with a thick coating of various kinds of vegetation, which take up the surface area and use the available plant-food underneath; it is also usually too compact, or even in some cases too loose, for the roots of foreign growths; also the plant-food required for the latter, although there in abundance, is mostly in an insoluble condition, and much deleterious acid may also be present.

If it is not intended to cultivate green-timbered land for some years it certainly should be ringbarked, to sweeten and improve the herbage and rot the roots of trees, so that the grubbing, when it takes place, will be very much less expensive. When clearing, take out all roots that may impede the plough right out to the greatest depth to which it is likely to be stirred, and in no case should this be less than 8 inches. Make one operation when means will permit; bad clearing means broken ploughs, broken machinery, and continuous work through removing fallen timber for years to come—far the dearer way in the long run. Ploughing and other modes of tillage turn the natural grasses and other vegetation lying on the surface into humus for future use, the soil is loosened and the particles which compose it are separated so as to permit of the free circulation of air and water, and the young roots can easily find their way among the channels so formed. The soil underneath is also brought to the surface,

and there sweetened by exposure to the sun, frost, and all atmospheric agents that tend to sweeten and enrich it; harmful acids are also driven out, and the mechanical nature of the soil is changed in every way for the better. Good cultivation must be practised to obtain good results. It is questionable if bad cultivation is better than nothing, because good land in its natural state may be a source of profit to the owner for grazing purposes, while bad cultivation simply destroys the natural grasses and grows often nothing but weeds in their stead: it always costs something, too, and may return nothing.

Tickling the soil and blackening the surface is not ploughing. This operation must be done deeply and thoroughly, so that the ground may be turned over, pulverised, and fit to grow the crop intended for it. Average soil is in proper condition for operations when it contains about half the quantity of water that it can take up; but it is better, and more especially in clay lands, to plough when rather dry than wet.

In ploughing the first time where a further operation is intended later on, it is preferable to plough on the dry side and turn up good-sized clods, leaving these in this state for exposure to the atmosphere. In this way a far greater surface is aerated than if laid or worked to an even surface; the rough clods soon moulder down, and can easily be broken up when required; but before seeding the surface should be brought into a fine state of tilth, and especially should this be so for small and delicate seeds. Anything that impedes the progress of young roots, such as large clods, should be broken up, for such are unsuitable for supplying food to young roots even if they could enter them, which they cannot; the adjacent soil, well tilled, is asked to supply the rootlets which should enter them, and is asked to do more than its share in bringing these plants to perfection—by reason of the manifold openings in well-tilled earth they entice roots to penetrate their manifold openings that are full of soluble plant-foods. Not only is good tillage necessary for the development of roots, but it warms the land, provides air and moisture, without which no seed can germinate. Moreover, how can the tender blade which first shoots with the root find its way to the surface through heavy impenetrable earth? If it does not do so quickly it dies. Much seed is rendered useless through bad cultivation; it germinates, but never reaches the surface. There is also very little capillary action in soil that is too compact; it can neither absorb water freely nor give it off evenly and continuously as well-cultivated land can.

Now, take ploughing that is done at the same depth year after year until a hard-pan is made like a well-beaten road. How can young roots penetrate this? They cannot, and are turned off from their proper direction, which is first downwards, and hamper the lateral roots which develop afterwards by sharing with them the surface plant-food, which should properly belong only to them. In dry weather, then, it follows, as there is no connection with the subsoil deep down where moisture is,

the plants die. Ploughing twice before cropping is recommended; if the land is clean, deeply at first, say 6 to 7 inches, and afterwards, before sowing, 3 to 4 inches. Crops like wheat, for instance, like a firm condition of the subsoil, therefore plough shallow last. If, however, weeds are plentiful, shallow ploughing should be first, in order that any seeds may be induced to germinate, and afterwards be turned under and buried by a deep sod.

Shallow soils, with sour, stiff subsoils, should be brought gradually to the surface, and in such cases deep ploughing, for some years at any rate, should not be practised.

Too much rolling in New England, where the soil is more often too full of moisture than too dry, is not advisable, and when it is done the harrow should immediately follow.

Harrowing wheat in dry spells is freely advocated up to, say, 6 inches high. After cultivation of maize and potato crops and the like is strongly recommended. This should be frequent and shallow, to destroy weeds and conserve moisture.

Wheat.—The early varieties of wheat are better sown somewhat late than early. In this district, if they are sown too early they are apt to be injured by late frosts. This month is a very good time, and even by sowing in July good results have been obtained. The spring is often moist, and plants do not require to be sown early and develop such deep roots during winter as is required in the drier parts. The Manitoba varieties, which do well here and do not mature quickly, might be sown a little earlier, say May, or the earlier part of this month. As we sow late we must sow rather thickly. One bushel to the acre in June is not too much with the drill, and about 1½ bushels broadcast.

Manures have not had a sufficiently lengthy trial here to state their value; but if sowing very late they would be helpful as far as superphosphates are concerned, in that this manure almost invariably promotes an earlier maturity.

Wheats that are recommended for this district are Jonathan, John Brown, Sussex, Power's Fife, and the Blue Stems; Zealand does very well, and is specially recommended for hay. Nothing but good plump grain should be sown, and in all cases it should be bluestoned for the prevention of bunt or stinking smut.

Oats may be sown for grain or for hay. Algerian, Red Rust-proof, and White Tartarian are good hay sorts. Others that have done well for hay or grain are Surprise, Tartar King, Golden Giant, and Danish Island. Surprise, Algerian, and Tartar King are the best of these for feed oats.

Rye, for green fodder or for grain, may be sown. Emerald for green feed and White rye for collar-making.

Onions may be sown. See that the land is in good heart and free from weeds.

Barleys, also, for green feed. Cape and Skinless are recommended. Sow pretty thickly. For malting, Invincible, Eclipse, Standwell, and Chevalier are good sorts.

Sow peas, cabbages, cauliflowers, parsnips, and carrots.

Garden Notes.

W. SANDERSON.

Vegetables.

DURING this month the vegetable garden should be thoroughly cleaned up, and on no account leave any rubbish lying about, such as weeds, useless vegetables, haulms, &c., which only harbour slugs, cutworms, and other insect pests which may destroy seedlings planted out later on.

If all the rubbish, together with plenty of farmyard manure, or anything in the shape of sweepings, bush rakings, leaves, grass, &c., is piled in a heap and occasionally watered and turned over, it will rot and be very useful later on for manure.

All tomato haulms should be destroyed by burning, as this prevents fungoid diseases, if any exist, infecting the young plants in the spring if grown in the same situation next year, but if possible avoid planting tomatoes in the same ground two years in succession.

Where slugs are troublesome, it is advised to sprinkle the ground freely with sulphate of iron (green vitriol), around but not too near the plants; this will destroy the pest if they come in contact with it. Another good method of collecting slugs is to place cabbage leaves or pieces of bagging on the ground, putting under them small pieces of fat, chop bones, &c., anything fatty will do, the slugs collect there and can be destroyed in the morning.

In almost any garden there is room for a small bed of strawberries, and if it is the intention to plant, now is a good time to do so. Select strong grown plants produced from the last season's runners, trim the roots and plant about 15 inches apart each way, say three rows in a bed; the plants can then be watered, cultivated, mulched and otherwise worked without walking on the ground. There are many sorts to choose from, and amongst the best are Marguerite and Glenfield Beauty.

Artichoke, Globe.—A few may be planted now, and as they grow to a considerable size, plant out about 3 or 4 feet apart, in good rich soil.

Artichoke, Jerusalem.—The tubers should now be quite ready for lifting and storing, but to avoid having a crop in the same place next year, care must be taken to collect every small bit that becomes detached during digging operations.

Broad Beans.—Sow largely from time to time during the month.

French Beans.—As this vegetable will not stand frost, sow in the warmer portions of the State only.

Brussels Sprouts.—Sow a little seed, or if any young plants are obtainable, plant out about 2 feet apart.

Cabbage.—Make a sowing of seed to keep up subsequent transplantings. If any young plants of Savoy Drumhead can be procured, they are a good sort to transplant now, being an excellent variety for winter use; a few red cabbage should also be planted out for pickling later on; try Niggerhead variety.

Carrot.—Sow a row or two of the Early Shorthorn variety.

Parsnips.—Make a small sowing in drills in land that has been previously well manured; the addition of fresh manure at the time of planting only tends to make the parsnips fork.

Peas.—Sow in rows 2 or 3 feet apart, according to the varieties planted; the high growing sorts require more space between the rows than the dwarf varieties.

Leek.—Make a sowing of seed and prick out any seedlings in heavily manured land. London Flag and Musselburgh are sorts that should be tried.

Endive.—This useful salad plant does remarkably well during the winter months, and owing to its peculiar, bitter flavour, many persons like it. When nearly full grown tie up or cover to blanch the leaves.

Rhubarb.—Plant out a few sets of winter rhubarb (Topp's Winter). This variety bears a heavy crop whilst the other sorts are dormant.

Celery.—Plant out a few seedlings of any varieties that suit the winter months best, such as Solid White, or Manchester.

Turnip, White.—As turnips should be grown quickly to avoid being pithy or strong, the seed should be sown in rich land.

Sow in drills thinly, afterwards removing any surplus plants down to about 6 inches apart; keep free from weeds, using the hoe freely.

Turnip, Swedes.—Sow a few rows of Swedes, treating the same as White Turnips, only allowing more space in the rows.

Parsley.—Sow a little seed where the plants are to remain permanently.

Spinach.—Sow seed or transplant any seedlings. This vegetable is well worth growing. It is not affected by aphis to any extent, and is not attacked by the Cabbage moth.

Herbs.—Sow a little seed of any kinds that are likely to be required, or a few plants might be pricked out from previous sowings.

Onions.—If sufficient plants have not been raised, make a further sowing, and attend to those already above ground, taking out all weeds, thin the plants, and cultivate frequently, for it must be borne in mind that if onions are not kept perfectly clean there is little chance of a crop.

Plant out Tree and Potato onions, garlic, eschalots, taking care that the latter are planted just under the soil, with only one bulb in a place—say about 1 foot each way.

Flowers.

The gardens will now require much attention in the way of digging and manuring, and as many bulbs are either dormant or just starting to shoot, and these may be injured during the operation, a good deal of care will be necessary.

Dahlias, chrysanthemums, &c., will now be dying down and may be cut back considerably until dug up or transplanted later on. Cosmos and zinnia are also past flowering and should be removed to make room for spring flowering plants. Among the best seeds to sow now for an early spring show are the following:—Acrolinium, antirrhinum, aquilegia, calendula, calliopsis, carnation (Marguerite), coreopsis, gaillardia, pansy, polyanthus, forget-me-not, cornflower, daisy, dianthus, poppy, stocks, wallflower, leptosyne, and pentstemons.

A good collection of pentstemons should certainly be planted in every garden, for taking all things into consideration, soil, weather conditions, &c., they produce plenty of blooms for the best part of the year, and oftentimes make a good show when very few other plants are in flower.

Seedlings of these may be obtained from the city seedsmen.

Another plant worth growing is the verbena: it makes a splendid show of flowers, and withstands any amount of dry weather. Bouvardias are an acquisition to the garden; the bloom of this plant should be more appreciated than it is at present, but the fact that this plant will not withstand dry weather may account for its absence in most gardens, especially where there is a limited water supply.

Roses being, perhaps, the favourite flower in the garden, no doubt many varieties will be planted out, and the present time is a good one for so doing. In addition to the large number now catalogued by the leading nursery men which are not classed as novelties, and are obtainable in great variety at reasonable rates, there are constantly being added new varieties or novelties which command higher prices. From the lists contained in the catalogues a good selection can be made; orders should be placed as soon as possible (if this has not already been done) as only a limited stock of some varieties is grown, and by delaying this matter disappointment may result. No time should be lost in getting them planted after they arrive, as no matter how well they are packed, they are better in their permanant position, but before planting, trim the roots with a sharp knife, and cut the branches back to 2 or 3 inches, leaving, say, two or three spurs.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
New South Wales Sheep Breeders' Association	A. H. Prince	July 1, 2, 3, 4
Deniliquin P. and A. Society	L. Harrison	,, 18, 19
Hay P. and A. Association	G. S. Camden	,, 22, 23
Condobolin P. and A. Association	G. Bennett	Aug. 4, 5
Narandera P. and A. Association	W. T. Lynch	,, 5, 6
National A. and I. Association of Queensland	C. A. Arvier	,, 10 to 15
Forbes P., A., and H. Association	N. A. Read	,, 12, 13
Cowra P., A., and H. Society	J. Fraser	,, 18, 19
Parkes P., A., and H. Association	G. W. Seaborne	,, 19, 20
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 25, 26, 27
Murrumbidgee P. and A. Association	A. F. D. White	,, 25, 26, 27
Grenfell P., A., and H. Association	Geo. Cousins	Sept. 1, 2
Germanton P. and A. Society	J. Stewart	,, 2, 3
Albury and Border P., A., and H. Society	W. I. Johnson	,, 8, 9, 10
Young P. and A. Association	G. S. Whiteman	,, 8, 9, 10
Cootamundra A., P., H., and I. Association	T. Williams	,, 15, 16
Molong P. and A. Association	C. E. Archer	,, 16
Cowra P., A., and H. Association	E. A. Field	,, 16, 17
Temora P., A., H., and I. Association	John Clark	,, 22, 23, 24
Queanbeyan P. and A. Association	E. O. Hinksman	Oct. 1
Lismore A. and I. Society	T. M. Hewitt	Nov. 11, 12, 13

1909.

Kiama A. Association	R. R. Somerville	Jan. 26, 27
Kangaroo Valley	E. G. Williams	Feb. 18, 19
Gunning P., A., and I. Society	W. T. Plumb	,, 25, 26
Tenterfield P., A., and M.	F. W. Hoskins	Mar. 2 to 6
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 10, 11
Inverell P. and A. Association	J. McIlveen	,, 16, 17, 18
Camden A., H., and I. Society	C. A. Thompson	,, 17, 18, 19
Upper Hunter P. and A. Ass., Muswellbrook	J. M. Campbell	,, 31 Apl. 1, 2

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MONTHLY WEATHER REPORT.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

SUMMARY for April, 1908.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture (Saturation=100).			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	% of the year's Evaporation.
29·94 16	30·46 7	30·18	37·1 27	84·5 16	62·1	63·1	54 10	95 17	76	·257 3	3·257	3·185	6

Rainfall... { Points ... 3/15, 2/16, 40/17, 83/18, 9/20 } Dates = 137 points.

Mean for April for 16 years = 235 points.

Wind ...	N	NE	E	SE	S	SW
	1	8	1	6	3	2

Greatest daily range of temperature = 37·3° on 2nd.
Frost on 27th.

W. MERVYN CARNE,
Observer.

Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 273.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVIII.

Trees other than Conifers and Palms:

Oaks.

Introductory Note.

I HAVE dealt with the Conifers so far, and the friendly letters received while the articles were appearing have included a number of useful notes, which may find a place in an improved edition some day.

I now propose to tackle the non-conifers. I shall exclude those trees which are indigenous to New South Wales, since these are already being dealt with in my pictorial work,* and there is so much to be done that we cannot afford any duplication. The present series will, however, not exclude Australian trees. For example, if a tree be a Queensland native, which does not naturally extend into New South Wales, I shall not hesitate to include it in the present series if I think it is worthy of cultivation.

The principal difficulty experienced in a new venture like this is want of illustrations. People like pictures. Even if a tree photographed may not be the best of its kind, it may still have some value, since it may show some of the characters. I find it difficult to get illustrations. The Government Printer has very generously come to my assistance so far as the trees in the Botanic Gardens are concerned, and as the articles proceed it will be observed what a rich arboretum (a garden of trees, as distinct from shrubs and herbs) we have in Sydney. But many trees cannot be illustrated because of the crowded nature of the Garden, which prevents their form being properly shown in a picture. Further, I do not want these articles only to display Sydney trees; I want pictures from all parts of the State. Will my readers help me for the common good? Will they send me good photographs of trees growing in any part of the State, or tell me where such photographs can be obtained? It is obvious that I cannot send an itinerant photographer to

* "The Forest Flora of New South Wales." Quarto; each part profusely illustrated. Thirty-two parts have already appeared. Price, 1s. per part, or 10s. per dozen parts. Postage, 2d. each part extra. Apply Government Printer, Sydney, or any bookseller.

photograph trees; so that it is no use for a friend at Moree, for example, to tell me, "If you will only send a photographer up here, I will show him a splendid tree."

For want of illustrations, I cannot arrange my articles according to a proper botanical or arboricultural classification. I begin with the oaks (*Quercus*) simply because I have some pictures of them.

I cannot hold out any inducements at present to professional photographers to take tree photographs on speculation. The sentiment about our native trees is touching. Acres of cold type are brought into play. No trees are like Australian trees; no Australian trees are like New South Wales ones. Study of them develops the national sentiment. How nice it is to teach our children about them; and so on. Then I go to one of the leading photographers in Sydney, and say to him, "Mr. - -----, I am a buyer of photographs of New South Wales trees; send your man all over the State for subjects." He retorts: "My natural taste inclines that way, and I have shown my sincerity by spending over £100 in obtaining a large number of pictures of New South Wales trees; but you are the only man who has ever bought one from me."

So that this photographic door is closed to me. Fellow New South Welshmen, you buy photographs of sheep, of horses (especially racehorses), of milking-cows, of politicians you buy a few, and of actresses probably more, but you do not take portraits of trees, and do not buy them, simply because this form of encouraging Australian industry has not been brought home to you. A well-grown tree is one of the noblest works of Nature! My message in the articles which follow is only to lovers of trees. Trees have their points, just as pigs and dogs have. Will you let me win the sympathy of some of you (I am not so foolish as to expect everyone's taste to be directed to trees) for our trees, not merely our native ones, but the imported ones which do well, or which promise to do well, in our richly endowed State of many soils and many climates?

There is very little literature on the subject written in New South Wales for New South Wales people, and still less with illustrations; so that I am engaged in missionary effort, and I feel sure I shall have sympathy in conducting the campaign I have undertaken.

I shall not only deal with trees already acclimatised in New South Wales, but shall include those which I think will readily flourish in some parts of this State, and promise to be valuable acquisitions.

It would be a very desirable thing if landowners would do a little specialising in regard to tree-planting. For example, if one gentleman would make a collection of oaks, another of poplars, another of pines, they would be of great interest to the planter himself; and, if he would record not only his successes, but his failures, much valuable information would be secured for the country which can be obtained in no other way. Of course such specialisation would not interfere with any miscellaneous planting he may desire to indulge in, but a State arboretum seems still a long way off, and when

it is realised we shall probably only have one, that is to say we shall have experience of only one district.

Meantime, if gentlemen will favour me with a list of the planted trees on their properties, with notes on their experience of them, I shall be glad (with their permission) to quote such notes in the present series of articles. If they can state age and size, including girth of trunk at 3 feet from the ground, such information would be of real value.

QUERCUS.

(The Oak.)

The genus *Quercus* belongs to the family Cupuliferæ, and its best known member is the British Oak (*Q. robur*, including *Q. pedunculata*, and *Q. sessiliflora*). There are about 350 oaks scattered throughout the world, the principal countries of which they are native being North America, Europe, China, Japan, and other parts of Asia. They extend from Japan to the Himalaya, and occur in the Malay Archipelago. Darwin's dictum that variation is most observed in the largest genera finds no exception in Quercus.

In Australia the term oak has been loosely applied to a number of trees whose timbers reminded the early settlers of that of the British oak, in its fissile nature and blotched grain; thus we have the Forest, Swamp, and other She Oaks (Casuarina), and the Silky and other oaks belonging to the Proteaceæ.

As a matter of convenience, I have grouped them into the three great divisions of the world, in (*a*) America, (*b*) Europe, (*c*) China and Japan, &c., and for easy reference I will arrange the species in alphabetical order of species names.

Speaking generally, the oaks thrive best in strong, deep, moist soils. The acorn soon loses its germinating power, so that it is desirable to sow it as soon as possible after it becomes ripe, and it is best, if it can be managed, to plant the acorn where it is desired that the future oak shall grow. Failure can be guarded against by planting two or three acorns near each other and preserving the strongest plant should more than one survive.

Oaks are valuable as ornamental trees; they have special merits for both avenue and specimen planting.*

The acorn cups of some, and the bark of others, are valuable tanning agents, supplementing the dark-coloured tannages of our wattle-bark. At present these oak products are imported into Australia. The foliage of some has some merit as stock feed.

Then the value of oak for timber has passed into a proverb. Not all oaks are, however, valuable in this respect, but the oaks are so diverse, and our climates and soils are so diverse, that we should experiment freely.

Oaks usually form round-topped trees with symmetrical heads, and are divided into two groups—the deciduous and the evergreen.

* Oaks are planted on boulevards, avenues in parks and cemeteries, and more recently in the cities. They make a permanent tree, very free from insects, and unsurpassed by any shade tree. (Meehan, speaking of Pennyslvanian and temperate American conditions.)

Select Bibliography.

1. Die Eichen Europa's und des Orient's. Dr. Theodor Kotschy. 40 folio plates (coloured). Wien und Olmüz, 1862.
   A very fine work. For European and Asia Minor Oaks only. Quoted as "Kotschy."
2. Sargent's "Silva of North America" (Vol. VIII).
   A classic. The illustrations superb. Quoted as 'Sargent."
3. Illustrations of West American Oaks, from drawings by the late Albert Kellogg, M.D. The text by Edward L. Greene. Published from funds provided by James M. McDonald, Esq., San Francisco, May, 1889. Part II, June, 1890. Quoted as "Kellogg."
4. The value of Oak-leaves for forage. W. W. Mackie. Bull. 150. Univ. California Exp. Station (1903).
5. "Select extra-tropical plants." (Mueller.)
6. "The Oak; a popular introduction to forest botany." (H. Marshall Ward.) "Modern Science" series, Kegan Paul, London (1892). Morphology, chiefly.

The North American Oaks.

1. *Q. agrifolia*, Née. "Live Oak"; a "Black Oak." Fig. in Kellogg, also Sargent, t. 403; Hooker's *Ic. Pl.* t. 377.

A low, round-topped evergreen tree, occasionally 80 or 90 feet in height. Not an important timber-tree, except for fuel. The acorns important to the Indians of Lower California (Sargent).

The timber compact, hard, and of great strength, but the shortness of the trunks and flexuosity of the large main branches render it unfit for sawing into boards; it furnishes fuel of the best quality (Greene).

Western California and Mexico: ascends to 2,800 feet in S. California. Mostly a maritime species. L 18 a.*

2. *Q. alba*, L. "White or Quebec Oak." Fig. Sargent, tt. 356 7.

Wood used for ship-building, and also by wheelwrights, coopers, and others. Pliable, most durable, one of the very best of all woods for casks, also of first class value for cabinet work, for machinery, spokes, naves, beams, plough-handles, agricultural implements, carriages, flooring, basket-material. (Sargent.) A large and valuable tree.

From Canada to Florida, westerly to Texas, flourishing in deep, rich soil.

Acorns an article of commerce. L. 29 c.

3. *Q. bicolor*, Willd. (*Q. platanoides*, Lam.; Syn. *Q. prinus*, L. var. *bicolor*, Spach.) "Swamp White Oak." Fig. Sargent, tt. 380–1.

A deciduous species; a large tree. The wood splits readily into tough, thin strips, from which rough baskets are made.

South-eastern United States. Thrives in deep, rich forest soil on the borders of rivers and swamps.

Acorns an article of commerce. L 29 c; U 3 (near the *Metrosideros*).

* These numbers refer to the place of a specimen in the Botanic Gardens, Sydney.

4. *Q. californica*, Cooper in *Smithsonian Rep.* (1858) 261 (Syn. *Q. Kelloggii*, Newb. and *Q. sonomensis*, Benth.). "The Black Oak." Fig. as *Q. Kelloggii* in Kellogg; as *Q. californica* in Sargent, t. 416.

A small deciduous tree, generally found near Conifers. It is one of those oaks which, in its native habitat, are eaten by cattle and horses, sheep, and goats (Mackie). Timber makes excellent axles for trucks, buffers for cars, and is available for many useful purposes.

Western United States (Oregon and California, often reaching elevations of 7,000 to 8,000 feet); scarce near the coast.

5. *Q. chrysolepis*, Liebm. The "California Live Oak," "Maul Oak," or "Green Oak." Fig. Sargent, t. 398; also Kellogg.

A tree of 40 to 60 feet, with large sweeping branches.

"Wood heavy, very strong, close-grained, compact, difficult to work . . . somewhat used in the manufacture of agricultural implements, waggons, &c.; the most valuable oak of the Pacific forests.

"More valuable as a timber-tree than the other oaks of Central California; it produces heavy, very strong, hard, tough and close-grained wood. Although difficult to cut and work, it is used in the manufacture of agricultural implements and waggons."--(Sargent.)

It is used as a browse for sheep and goats, and sparingly by cattle.

Oregon and California, U.S.A., often reaching an elevation of 9,000 feet, when it becomes a shrub

In New South Wales it does not appear to be in cultivation.

6. *Q. cinerea*, Michx. (*Q. brevifolia*, Sargent). "Blue Jack."

See Sargent's "Silva of North America," t. 431, where it is figured as *Q. brevifolia*, Sargent, that author taking the synonym *Q. Phellos* var. *brevifolia* of Lamarck, and raising Lamarck's variety to the rank of a species.

A small tree of 15-20 feet. The leaves are lanceolate, an unusual shape for an oak.

It inhabits sandy barrens in the southern United States and upland ridges, and is recommended here for trial in coastal localities. It is too small for the timber to be of much importance.

M 29; L 26 c.

See photo.

7. *Q. coccinea*, Wangenh. "Scarlet Oak." Fig. Sargent, tt. 412-3.

Chiefly valuable for the brilliant scarlet colour which its leaves assume late in autumn, when those of most of its companions have fallen (Sargent).

Suitable for the colder parts of New South Wales in light, dry, usually sandy soil. The acorns are an article of commerce.

L 33 d.

8. *Q. cuneata*, Wangenh. (*Q. falcata*, Michx.; *Q. digitata*, Sudw., following the variety name *Q. nigra digitata*, Marshall, 1785). "Spanish Oak." Fig. by Sargent as *Q. digitata*, tt. 420, 421. A large deciduous tree.

Quercus cinerea, Michx.
Botanic Gardens, Sydney.

Produces excellent tanners' bark. It is finer grained and more durable than that of *Q. rubra*, and is used for staves, railway carriages, and in ship-building (C. Mohr).

South-eastern United States from New Jersey to Texas and Florida.

Found in dry, sandy ground, and can be utilised for sea-coast planting.

"The Spanish Oak is one of the most distinct of the Black Oaks of North America which bear lobed leaves, and, in spite of the various forms its leaves assume, it may always be easily recognised by their drooping habit and the peculiar rusty covering of their lower surface. Their ample size, curious forms, and distinct colouring make the Spanish Oak a conspicuous and a most desirable ornamental tree, and it is often used to shade houses and village

streets in the upper districts of the South Atlantic and Gulf States, where noble old specimens may often be seen."—(Sargent, *loc. cit.*, p. 149.)

9. *Q. Douglasii*, Hook. et Arn. "Blue Oak," "Rock Oak," "Mountain White Oak." Fig. Sargent, t. 386. Hooker's *Icones*, tt. 382–3.

A tree of medium size, with a dense, round-topped symmetrical head and dark-bluish leaves.

"On account of the dryness of its leaf, only goats and sheep browse on it, but the acorn mast, which is plentiful and quite certain, is excellent feed for hogs, cattle, sheep, goats, and often for horses."—(W. W. Mackie.)

Timber of little value, but one of the oaks likely to be useful in the drier parts of New South Wales.

"No American oak, with the exception perhaps of *Quercus dumosa*, is more variable than *Quercus Douglasii* in the size, shape, and dentation of its leaves. They are readily recognised in the field by their blue colour, as this is the only blue-leaved oak of Northern and Central California."—(Sargent, *op. cit.*, p. 79.)

10. *Q. Garryana*, Dougl. "White Oak" or "Mountain White Oak." Fig. Sargent, t. 364 ; also Kellogg.

"This species, almost unaided, supplies pasture for thousands of sheep and goats as well as cattle and horses, and not only keeps them up, but actually fattens them. The stock keep whole ranges of it eaten down often to within less than 2 feet of the ground. Aside from the value of the leaves, the acorn, which is quite sweet, forms a rich diet for stock. The mast is usually sure and abundant."—(W. W. Mackie).

A valuable timber-tree. It is the only oak used for lumber on the Pacific Coast, and furnishes the oak lumber for the furniture factories of West Berkeley.

Confined to the lower and middle elevations of the mountains, chiefly of Western California.

11. *Q. imbricaria*, Michx. "Shingle Oak," "Laurel Oak." Fig. by Sargent, t. 432.

Native of the United States, extending from Pennsylvania southwards ; it is one of the most abundant oaks of the lower Ohio River. It inhabits rich uplands and occasionally the fertile bottom-lands of rivers.

"*Quercus imbricaria*, with its symmetrical habit, smooth bark, and lustrous dark-green entire leaves, is one of the most beautiful of the American oaks, and a most distinct and desirable ornament of the parks and gardens of Eastern America."—(Sargent).

It would appear to be unknown in New South Wales, in the colder parts of which it might be expected to flourish.

12. *Q. lobata*, Née (Syn. *Q. Hindsii*, Benth.) "White Oak," "Valley Oak." Fig. Sargent t. 362, and Kellogg.

It is a noble species, said by Sargent to be the largest and most graceful of the oaks of Pacific North America, but the timber is inferior in quality.

It is the conspicuous oak of all the inland plains of California, frequenting rich river valleys. It extends to Mexico.

Sargent says: "Like other California oaks, *Quercus lobata* does not flourish beyond the borders of its native State, and the attempts that have been made to establish it in Eastern America and in Europe have not been successful." It is probable, however, that, since many Australian regions have their counterparts in California, we may be more successful.

Quercus nigra, L. (Q. aquatica, Walter). 10 years' growth; leaves falling.
State Nursery, Campbelltown.

13. *Q. lyrata*, Walter. The "Overcup Oak," "Swamp White Oak." Fig Sargent, t. 374.

Wood stated to be heavy, hard, strong, tough, durable in contact with ground, but difficult to season.

"*Q. lyrata* inhabits river swamps or small deep depressions in rich bottom lands often filled with water, and usually wet throughout the year"—(Sargent.)

United States, extending from South Illinois to the Gulf States.

14. *Q. macrocarpa*, Michaux. The "Burr Oak," "Mossy Cup Oak," so called from the mossy fringe about the rim of its deep acorn cup. Fig. Sargent, t. 373.

It is one of the most valuable hardwoods of North America, being used for fence posts and sleepers. It is a fine tree for ornamental planting. See Circular 56 of the Forest Service of the United States Department of Agriculture

It is one of the largest trees found in Central North America. It frequently attains a height of 80 to 90 feet, and a diameter of 3 to 4 feet. It is best suited to deep, rich, river-bottom soils.

Canada and the United States (chiefly in the lowland forests of the Mississippi basin).

Its acorns are an article of commerce.

15. *Q. nigra*, L. (syn. *Q. aquatica*, Walter). "Water Oak." Fig. Sargent, t. 428.

"A tree occasionally 80 feet high, inhabiting the high sandy borders of swamps and streams, and the rich bottom lands of rivers."—(Sargent.)

Common in the Southern States, and a favourite because of the ease with which it can be transplanted and the rapidity of its growth.

"It is a favourite shade tree and is frequently planted in the streets and squares of towns and in pleasure grounds."—(Sargent.)

Acorns an article of commerce.

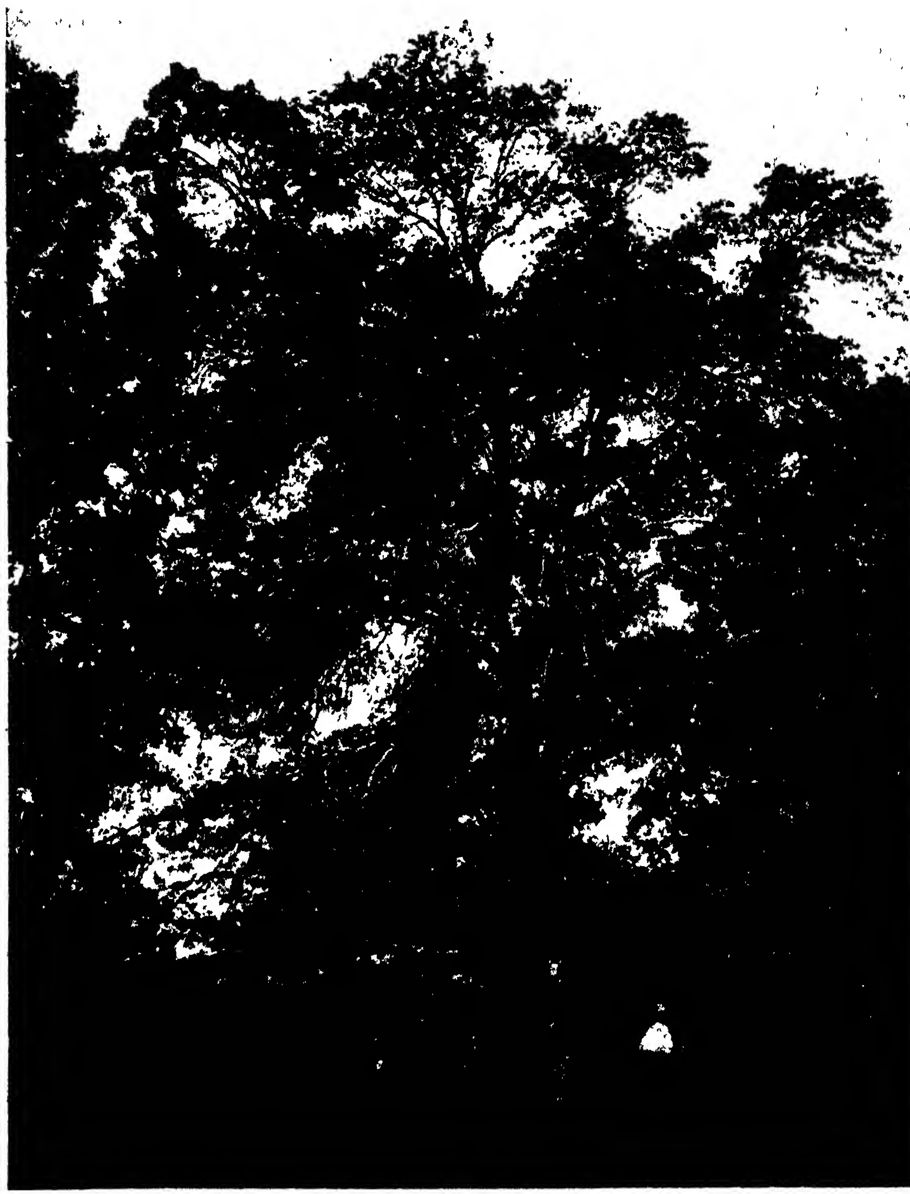
Of the tree shown in the figure, Mr. John McEwen says, "Ten years' growth: height about 18 feet. Planted on grass. Does well here, but should do better if more rainfall."—(State Nursery, Campbelltown, 4'07).

See photo.

16. *Quercus palustris*, Muenchhausen. "Pin Oak." (It owes its name to the small branches which are inserted in the limbs and the trunk.) "Swamp Spanish Oak." Fig. Sargent, tt. 422–3.

Originally described in Germany from a cultivated specimen. It has been for over a century an inhabitant of the parks of Europe, where it often grows vigorously and attains a large size.

"Although less commonly planted in its native land, its symmetrical habit and the beauty of its summer and autumn foliage make it always a distinct and desirable ornamental tree, and no other oak is better suited to shade the highways or adorn the parks of the Northern States."—(Sargent.)



Quercus palustris, Muench.
Camden Park.

Meehan singles out this oak as particularly adapted for side-walk (pavement) planting in cities, since it seems to thrive under the adverse conditions usually found in such places. It should be well tried in our colder regions of good rainfall.

See photo.

17. *Q. Prinus*, Linné. "Swamp White Oak," or "Rock-chestnut Oak," var. *bicolor* (*Q. bicolor*, Willd.), which see. Fig. Sargent, tt. 375–6.

Yields an excellent tan-bark. It furnishes a timber used by builders and coopers, and makers of agricultural implements. Commercially it is not distinguished from the wood of *Q. alba* and *Q. macrocarpa* (Sargent).

A tall tree, inhabiting the borders of streams and swamps, growing in low, moist, fertile soil (Sargent). Found in the cooler parts of the eastern United States, and extending to Canada.

18. *Q. rubra*, L. "Red Oak." Fig. Sargent, tt. 409–10.

A stately, deciduous tree, 70–90 feet in height, and with a stem diameter of 2–4 feet.

Best suited to porous, sandy, or gravelly clay soils, but they must be well drained. Does not do well when the air is very dry. It is stated to surpass all oaks in the rapidity of its growth. (Circ. 58 of the Forest Service of the U.S. Dept. of Agric.)

"Endowed with a constitution which enables it to withstand climatic conditions unlike those of its native land, *Quercus rubra* has succeeded in Europe better than any other American oak, and individuals more than a century old may be seen in England, France, and Germany. No oak of the northern States grows more rapidly or can more easily be transplanted, and few trees are better suited to ornament the parks and roadsides of the northern United States."—(Sargent, *op. cit.* p. 127.)

It should be well tried in New South Wales.

See photo.

19. *Q. rugosa*, Née (*Q. crassifolia*, Humb. and Bonpl.).

A small evergreen tree, reminding one of *Q. pseudo-suber*. Not much is known in Australia about this species.

It is a native of Mexico.

L 15 a : M 8.

20. *Q. Skinneri*, Bentham. The "Cozahual."

This species presents a resemblance to the walnut (*Jaglans*) in its lobed and wrinkled seed-leaves or cotyledons. The large acorns are used for feeding domestic animals. See Hooker's *Ic. Pl.*, t. 402.

Mexico to Guatemala, ascending to 7,000 feet. It does well in Sydney District. Should be tested on the table-lands. L 32 b.

21. *Q. stellata*, Wangenheim (*Q. obtusiloba*, Michaux). The "Post Oak." *Q. minor*, Sargent (after the variety name *Q. alba minor*, Marshall), under which name it is figured in Sargent tt. 368–9.

"Its dense, round-topped head and its dark foliage, which at a distance sometimes appears nearly black, make it easy to recognise the Post Oak in the landscape; and always a beautiful tree, it might be used to advantage in the decoration of parks and pleasure-grounds in the eastern United States."—(Sargent.)

A large tree in exceptional situations. It is the most abundant oak of Central Texas, being usually found on limestone hills and sandy plains. It

therefore seems indicated for trial on our sandy coast lands and on our western plains.

22. *Q. velutina*, Lam. (Syn. *Q. tinctoria*, Michx.; *Q. coccinea*, var. *tinctoria*, A. DC.) "Black Oak," "Yellow Bark Oak," "Dyers' Oak." Fig. Sargent, tt. 414–5.

Quercus rubra, L.
Camden Park.

The yellow dye known as quercitron comes from the bark of the var. *tinctoria*, which is known as "Quercitron," "Yellow-barked or Black Oak."

It is inferior to some other oaks for ornamental planting, but inasmuch as the inner bark, which abounds in tannic acid, is largely used in tanning and it also contains a yellow dye, the tree is worthy of experimental culture.

Quercus virginiana, Miller (Q. virens, Ait.).
Botanic Gardens, Sydney.

This tree extends from Canada to the Gulf of Mexico and it is abundant in the Mississippi basin. It inhabits gravelly uplands and ridges (Sargent).

23. *Q. virginiana*, Miller (*Q. virens*, Ait.). It is well known in Sydney as *Q. virgens*, but *virginiana* is the older name. "Live Oak." Fig. Sargent, tt. 394–5.

A valuable shade-tree. Yields excellent timber, formerly much used for naval purposes.

One of the most valuable timber-trees of North America; formerly it was largely used in ship-building. The acorns were largely collected by the Indians, and afford valuable food for hogs (Sargent).

One of the most valuable trees presented by the United States to New South Wales. There are numerous specimens in the Botanic Gardens, but its value to Sydney may be learned from the specimens flourishing in the sterile, wind-swept Centennial Park. It prefers the coast districts.

"In the southern United States its beauty has been appreciated for more than two hundred years; and noble single specimens or avenues of live oaks guarding the approaches to the stately colonial mansions of Carolina and Georgia, and unsurpassed in majesty by planted trees of any other kind, testify to the ornamental value of this species, which surpasses the other oaks of North America in grandeur of port, beauty of outline, and solidity of trunk and branches. No American oak grows more rapidly or is more easily transplanted, and its general use as a shade-tree, with the scarcely less beautiful Laurel Oak, in the streets of southern cities, gives them their greatest charm." —(Sargent, *op. cit.* p. 102.)

M 1; L 17 d, 23, 30 f.

See photo.

24. *Q. Wislizenii*, A. DC. "Canon Live Oak." A "Black Oak." Fig. Sargent, t. 406.

A distinct and handsome tree, but a shrub in desert localities and on the coast.

"The leaves of this *shrub* are sought in preference to those of the Scrub Oak by sheep, goats, and cattle, and it is thus often found stripped of its leaves."—(W. W. Mackie.)

The wood is hard, tough, strong, and durable, and of great value for mechanical purposes, also making excellent fuel (Greene).

California, along the coast; also along the foot-hills and lower slopes of mountains.

(*To be continued.*)

Refrigeration on the Homestead.

Temperature for Cool Storage of Fruit, &c.

H. V. JACKSON and A. E. LEA.

With the continual advancement which is taking place in the improvement of machines, and the cheapening of mechanism through the simplification of parts, the use of refrigerated rooms for the storage of perishable produce is extending among business people, and it is only a matter of time when, no doubt, we shall see suitable plants installed on estates and dairy farms, whereby, in the warmer districts especially, the farmer will not only hold his milk and cream in a cool temperature, but the household will likewise take advantage of the opportunity to make use of cool rooms.

Several makers of high repute are now manufacturers of small refrigerating machines, which are self-contained and automatic in their working, and are easily managed by any person of ordinary intelligence. It does not require an expert engineer to work these small plants.

The time is not far distant when many successful pastoralists and farmers will realise the considerable advantage derived through the installation of a refrigerating plant on the estate.

Machines working upon the compression system and cold air are employed for the cooling of air in store rooms.

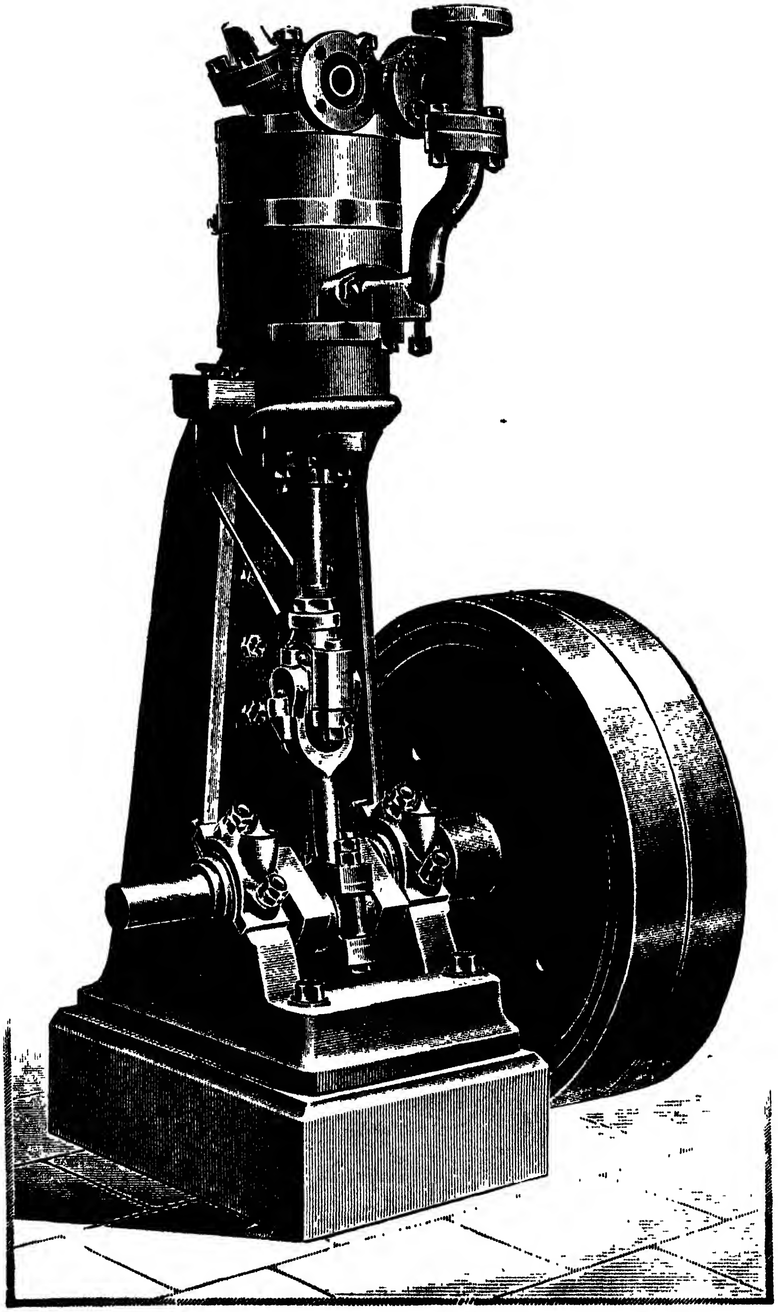
It is desirable, in some instances, that the cool chamber shall certainly be as dry as possible, though some discretion is necessary when using the space for the storage of fish and cheese, and even eggs may be kept in too dry an atmosphere.

As to refrigeration by means of compression machines, where the cooling is brought about through the evaporation of a volatile liquid, the refrigeration must be effected by cooling a non-congealable salt brine, and pumping it through a system of pipes in the store room, or by forcing a current of air generated by means of a fan to strike against surfaces reduced to a low temperature by expansion of the refrigerating agent.

What is known as the direct expansion system has the advantage of being more economical and more quickly effective than with the brine circulation, but there are certain disadvantages should a leakage of vapour from the cooling pipes take place, although some experts consider fears of damage from this cause to be groundless.

The cold air-blast system is a mechanism so constructed that the refrigerating pipes are in a separate room, connected with the store room, so that the air being cooled is then circulated through the store room by means of a fan. An advantage of this system is that if the temperature of the store room rises from any circumstance, dripping through the thawing of frost in the pipes is avoided, although this can be overcome by a false roof or pipe loft.

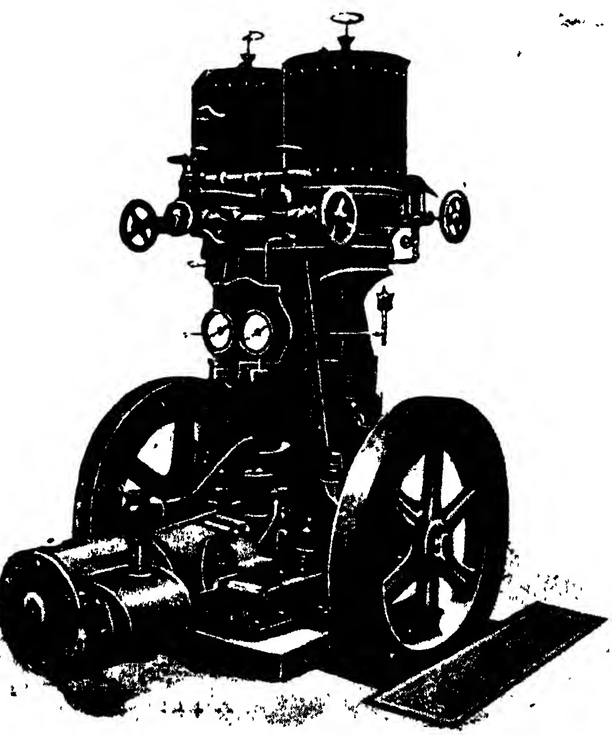
One of the most important points in the construction of a cool room is the insulation. The insulating material should be of a nature which is odourless; it should not readily take up moisture, but be compact (that is unshrinkable), impervious to vermin, and at the same time as cheap as possible.



No. 1.—Linde System.—Vertical, belt-driven machine.
Suitable for butchers, butter factories, cordial makers, and small ice plants. Capacity, 3 tons.

A variety of substances have been used for the purpose, some of which are of a composite character; while pumice-stone, charcoal, cork, asbestos, sawdust, and silicate of cotton or slag-wool is favoured. If charcoal is used it should be well dried and packed as nearly as possible to a consistency of 11 lb. per cubic foot; and silicate of cotton, 12 to 13 lb. per cubic foot.

In constructing cool chambers due attention is requisite to a proper system of ventilation; the opening of doors, from time to time, no doubt, permits the escape of vitiated air, but at the same time there is a loss of cold air when the doors are opened, which has to be made good by the refrigerating machinery. In some cases ventilating shafts are provided which can be regulated by the engineer.

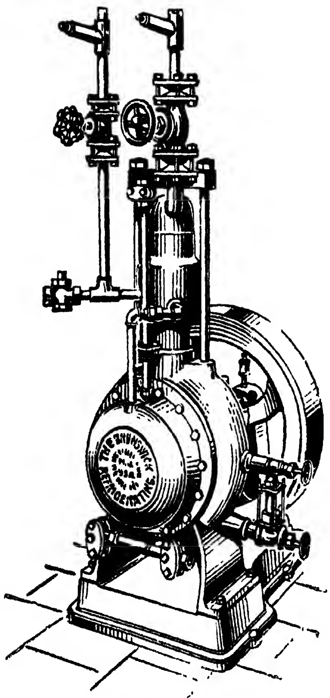


No. 2.—Frick Refrigerating machine.
Capacity, 4 to 10 tons. Joseph Baker and Sons, Kent-street, Sydney.

The construction of the chamber, therefore, requires proper provision for the circulation of air. The cold air will find a lower level than the warm air, and in reference to this matter of air circulation, Wallace Tayler says:—

Using a broad single distributing duct near the floor in combination with a false ceiling resulted in a very penetrating and uniform circulation of air, and in practical service it has been found to produce superior results. . . . . . This was accomplished by perforating the distributing ducts with small holes, and so proportioning them that a larger part of the flow of air is from the bottom of the ducts. The ducts are also perforated to some extent on sides and top. By piling the goods a few inches from the floor the air from the ducts flows under the goods and out to the centre of the room. This action is also assisted by having the greater number of the perforations in false ceilings in the middle, third, or quarter of the room, so as to draw the air out from the sides of the room.

B

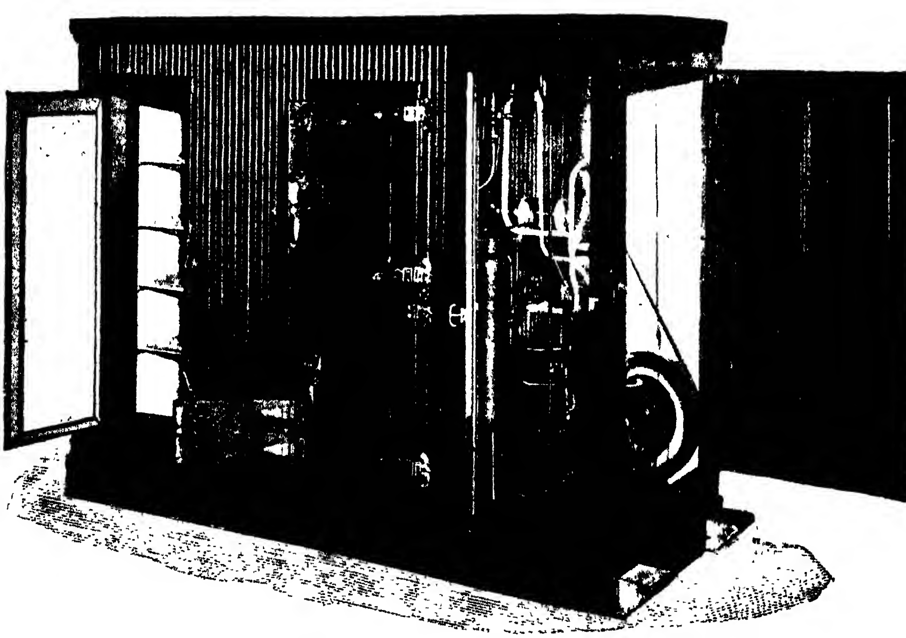


No 3. "The Brunswick"—Two-ton compressor.
Buzacott & Co., Sydney.

Where the farmer has erected a small refrigerating room, probably mainly for the purpose of keeping the milk and cream from the dairy in a satisfactory cool temperature, or for storing his butter, it must be borne in mind that it is very necessary products giving off odour should not at the same time be stored in the room. If eggs are being stored for any length of time care must be exercised in this respect also. It is desirable the room should be always sweet and clean. If at any time a damp and vitiated atmosphere has been set up, there is danger of moulds.

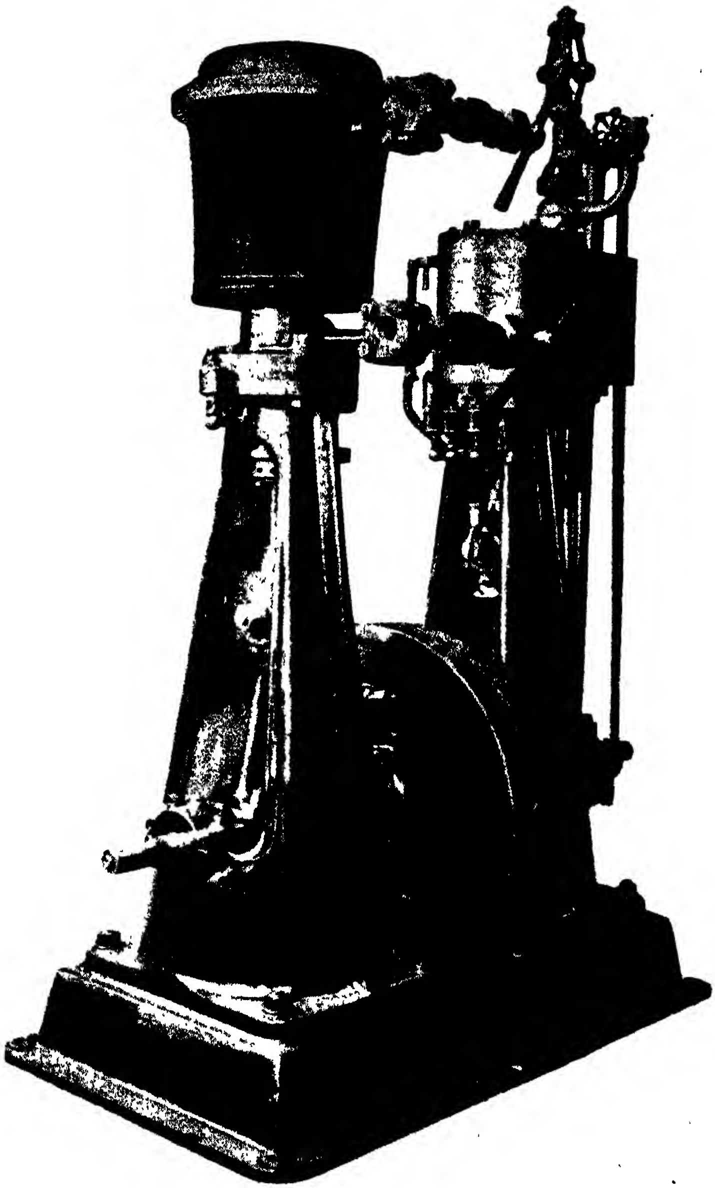
Onions, potatoes, fruit, meat, cheese, and such like, are very undesirable if in a condition which is odoriferous, and even sound onions, potatoes, cheese, and some odoriferous fruits will tend to taint other products.

The approximate cost of a refrigerating chamber 10ft. x 10ft. x 7 ft. would be about £90, constructed with charcoal insulation. The doors and frame could be purchased



No. 3a.—"The Brunswick" combination ice-making and refrigerating machine.
500 lb. refrigerating capacity. Buzacott & Co., Sydney.

in Sydney, and the rest of the work done by a carpenter on the farm. Cost of a refrigerating machine to keep this size of room at a suitable temperature for farm produce would be about £160. Cost of power to drive is not here included, as there may, in some cases, be engines already on the property, and in use for other purposes.

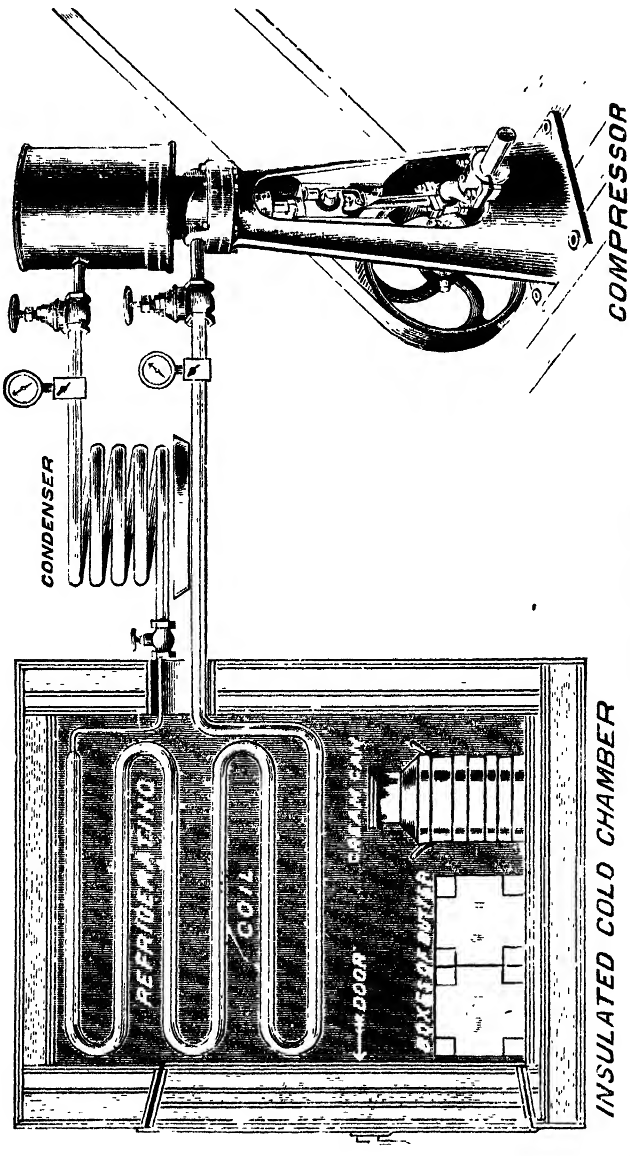


No. 4. Two-ton direct steam-driven machine.
Manufactured by Waugh and Josephson, Sydney.

The illustrations of several types of machines are :—

No. 1.—A Linde vertical machine, belt-driven, supplied by Wildridge and Sinclair, 97, Pitt-street, Sydney.

No. 2.—Frick machine, supplied by Joseph Baker and Sons, Kent street, Sydney.



No. 8.—Interior of small freezing room.

No. 3.—A Brunswick machine, supplied by Buzacott & Co., Market-street, Sydney.

No. 4.—A 2-ton direct steam driven machine, manufactured by Waugh and Josephson, Sydney.

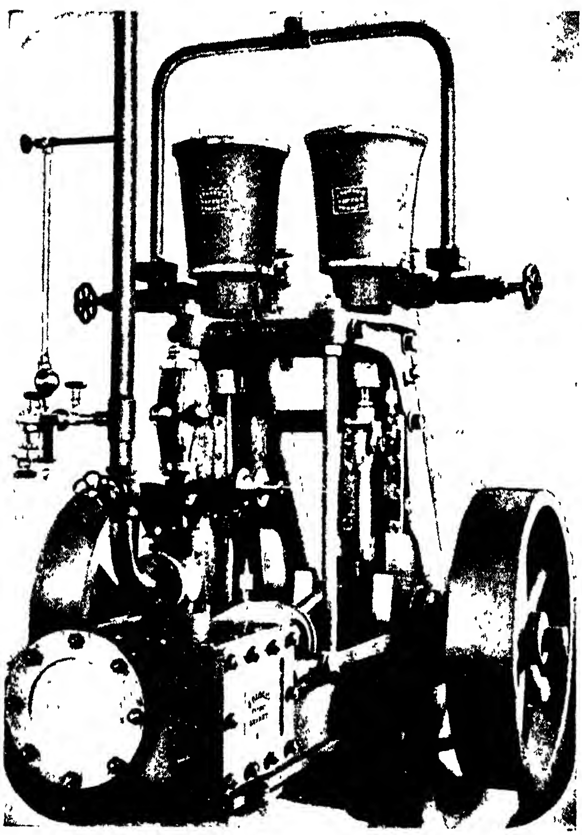
No. 5.—The Budge 6 ton refrigeration compressors, made by J. Budge, Pyrmont, Sydney.

No. 6. Hercules machine, from C. A. MacDonald, 63, Pitt-street.

The following is a specification for the construction of a small refrigerating chamber:—

The room should be built as near air-tight as it is possible to be made: each wall is composed of four thicknesses of tongued and grooved boards, two layers inside and two layers outside, with one layer of 3-ply P. and B. paper between each layer of boards

When starting to fix the second layer of boards, cut the first board down the centre, thus preventing the joints coming opposite to each other.

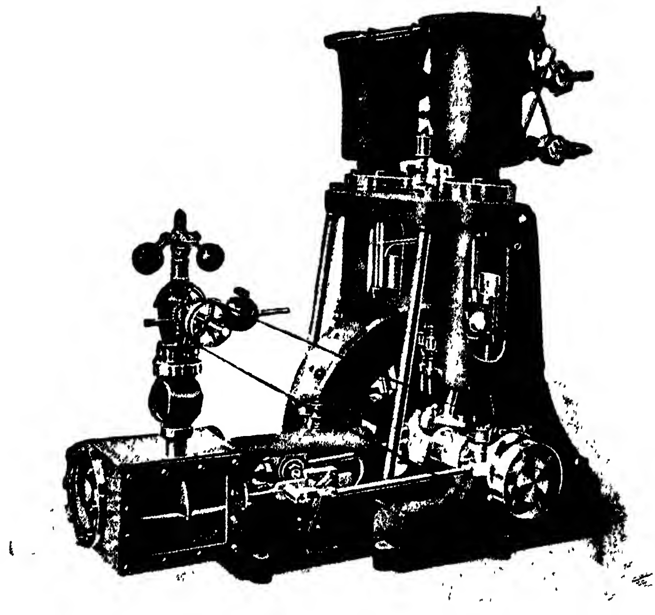


No. 5.—"The Budge"—Six-ton refrigeration compressor.
Australian design, and manufactured by J. Budge, Engineer, Pyrmont, Sydney.

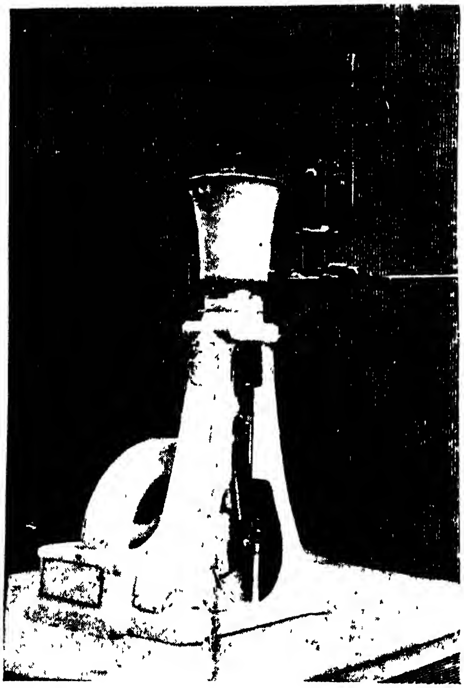
Floor to be composed of one layer of 6 in. x 1 in. T. and G. hardwood, then a layer of 1-ply Malthoid, then a layer of 6 in. x ¾ in. T. and G. Baltic; on these lay 9 in. x 3 in. joists, spaced 18 in. centre to centre, and fill in spaces with properly burnt dry charcoal, when all spaces are filled, lay on 6 in. x 4 in. T. and G. Baltic, then a layer of 1-ply Malthoid, and finish with 4 in. x 1¼ in. T. and G. hardwood: all boards being properly cramped together and securely nailed.

On this floor the studs for the walls are to be erected, composed of 4 in. x 2 in. timber spaced 18 in. centre to centre. Place these in position, as shown on sketch, so that the studs on outer lining do not come opposite the studs on inside lining. By doing this it allows a better space for insulating material.

Four in. x 2 in wall-plates placed on edge, and checked into studs, are strong enough for small rooms. All wall-plates to be kept flush with outside and inside of studs, thus leaving a space of 5 inches clear between the two wall-plates to get the charcoal down into the walls. The greatest care must be taken in putting the charcoal in, and make certain that no empty pockets are left. The room should be kept up well from the ground, so as to allow



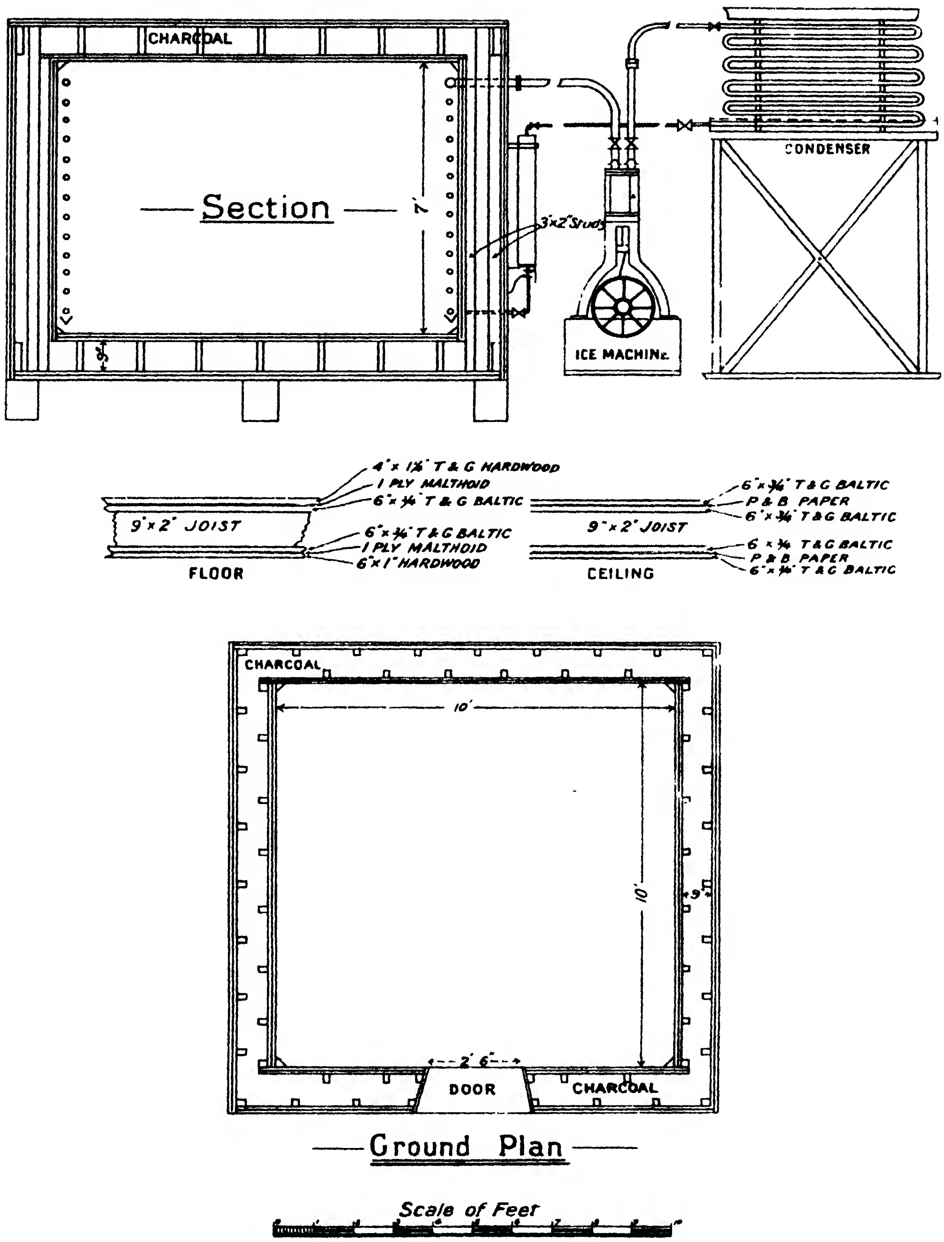
No. 6. Hercules steam-driven refrigerator.
5 to 25 tons C. A. MacDonald, 63, Pitt-street, Sydney.



No. 6a.—Hercules belt-driven refrigerator.
1 to 3 tons capacity. C. A. MacDonald, 63, Pitt-street, Sydney.

a current of air to pass under. This will prevent damp-rot in the bottom boards. It may be erected inside any existing shed available If no shed is in existence, then erect one large enough to prevent the sun striking on the structure at any side, and also keep out the wet.

The ceiling should be composed of 9 in. x 1¼ in Oregon joists set 18 inches centre to centre, lined on upper and lower sides with two thicknesses of 6 in. x ¾ in. tongued and grooved Baltic, and a sheet of 2-ply P. and B. paper between the boards; well fill spaces between the joists with charcoal. Should the top of the room be intended to be used as a working floor, then substitute the top layer of boards by using 6 in. x 1 in. hardwood, and have them thoroughly dry and well cramped together before finally nailing down.



Small Refrigerating Chamber

Construction

21836

A. E. Lea

Inside the room at all angles fix fillet pieces and corners. These must be fixed tightly, and should have a layer of Malthoid or P. and B. paper to form an air-tight joint.

Always bear in mind that when constructing a chamber of this kind, that the better the insulation the more efficient will be the working of the refrigerating machinery.

There is, of course, room for differences of opinion as to the several kinds of motive power in the market that would be suitable for driving the small ice machine.

The steam engine and boiler is a most reliable one, and is cheap to work where wood is plentiful, and it is easy of management.

The producer-gas or suction-gas plant, the latter preferable for small installations, and, lastly, the oil engine.

In erecting one of these small plants it would only require about 2 horse-power to drive the machine alone, but it should always be borne in mind that almost any kind of work can be greatly cheapened in production by the introduction of machinery, and it is advisable to obtain an engine large enough to do such extra work as sawing, corn-shelling, milk separating, churning, chaff-cutting, and even providing electric light for the homestead. The approximate cost of, say, a 4-horse plant would be about £160. The steam plant has an advantage over others, as steam can be utilised for scalding milk cans and other utensils.

Cold Storage of Eggs.

Owners would do well to arrange for having eggs examined before putting them into store, and all cracked ones should be removed Eggs coated with matter from broken ones will suffer injury if not cleaned.

In order that eggs may be kept fresh and good for from four to six months, it is necessary to see that only new-laid ones be selected; where possible, also, it is advisable to have them infertile, as when fertile eggs get exposed to a temperature of 90 degrees, for even a short time, the germ will start into growth, and no subsequent treatment will then avail to give them the quality of freshness. Eggs for storage should be gathered daily and placed at once in the storage boxes in a cool place. To attain the highest success, they should be graded as to colour and size, the boxes being marked accordingly. Care should also be taken to have them clean and free from unsightly stains. But it is not advisable to put them through a system of absolute washing. Dipping eggs in water tends to remove the natural "bloom" of the egg.

In New South Wales the boxes used are of trade size, holding 36 dozen or 18 dozen, and packers should see that they are made of odourless timber, as eggs are peculiarly liable to absorb flavours from their surroundings.

Another important point is to see that the boxes and fillers are thoroughly dry before using, otherwise mustiness is almost sure to ensue. Beyond the fillers of cardboard, no packing of any kind should be used, and in order to secure the best results it is recommended that the grease-proof odourless

cardboard fillers be used. These are obtainable almost as cheaply as the usual brown cardboard in general use.

If possible, new cardboard fillers should be used each year; those that have been stained with broken eggs, or holding the least moisture, will have a deleterious effect on the eggs, and are a frequent cause of mould.

When eggs are to be taken from the cold store (and more particularly in warm weather), the change from the cold atmosphere of the store-room causes a moisture to be apparent. Some people term this "sweating," and think it is some exudation from the eggs. Such is not the case; it is simply the atmospheric moisture, and can be easily avoided by taking the egg cases out of the cool room two days before they are required and placing the cases in a medium temperature for the time being.

When the eggs are small, and the top layer in the case does not reach the protecting lid, it is recommended that white paper be placed on top to act as a buffer in transit to and from the stores.

In his work on Mechanical Refrigeration, J. E. Siebel says that assuming 34° F. is the proper temperature for an egg-storage room, what is the proper percentage which it should contain, and how should the wet bulb thermometer or hygrometer or sling psychrometer stand in order to indicate that percentage of moisture? For answer according to Cooper the percentage of moisture for cold storage rooms, especially for eggs, should vary with the temperature as follows:—

Temperature in degree, F.	Relative humidity per cent.	Temperature in degree, F.	Relative humidity per cent.
28	80	35	65
29	78	36	62
30	76	37	60
31	74	38	58
32	71	39	56
33	69	40	53
34	67		

Therefore, for a storage temperature of 34° F. the moisture or relative humidity should be 67 per cent. (100 per cent. corresponding to air saturated with moisture); and by referring to Table on Relative Humidity we find that this corresponds to a difference between the dry and the wet bulb of 3·5° F. Hence the wet bulb thermometer should show 34–3·5 = 30·5° F.

As a rule, artificial drying of air in cool rooms is considered superfluous.

Cold Storage of Fruit and Vegetables.

With reference to the storing of fruit and vegetables, Siebel writes as follows:—In general, green fruits should be stored between 30° and 40° F., and fruits and vegetables should not be allowed to wither.

Citrus Fruits should be kept dry until the skin yields its moisture, then the drying process should be immediately checked.

Fruits, especially tender fruits, should be placed in cold storage just when they are ripe. They will keep better than if put in when they are not fully ripe.

Pears will stand as low a temperature as 32° F. Sour fruit will not bear as much cold as sweet fruit. Catawba grapes will suffer no harm at 26° F., while 36° F. will be as cold as is safe for a lemon, and 38° F. is considered the best temperature.

The spoiling of fruits at temperatures below 40° F. is due to moisture.

Oranges at a temperature of about 34° F. with good circulation, will keep from one to three months.

Melons may be stored successfully at 33° F. for a few days, a temperature of 40° F. being about right.

Plums, Cherries, and Strawberries are extremely perishable, and are only placed in storage for a comparatively short time at a temperature of about 40° F. to prevent rapid ripening or deterioration, tiding over an overstocked market, &c. Green plums have been kept, however, at 32° F. for ten weeks.

Peaches.—After three weeks' storage, deterioration sets in. At higher temperatures, 36° to 40° F., the commercial limit for storage is reached in from ten to fourteen days. To ensure success in storing peaches, every condition surrounding the growing, picking, the transportation, and the treatment in and withdrawal from the storage house, must be most favourable.

Pears, like all other tender fruit, should be placed in cold storage when still firm, and before the chemical changes which cause the ripening have set in, and they must be handled very carefully. The temperature at which to store them is from 32° to 40° F. Pears which have been kept in cold storage will spoil very rapidly after coming out, and should be consumed in as short a time thereafter as circumstances will permit. Pears should be picked as soon as the stem will readily part from the twig, and before any indication of ripeness appears; and, as in the case of apples, should immediately be placed in storage, but the temperature should not be as low as that required for apples.

Lemons. The best storage temperature for lemons is 38° F. for short storage, but below 36° F. they are liable to be injured, if kept at that temperature for any length of time. Lemons should not be expected to remain good in cold storage over four months.

Grapes for cold storage must be well selected and very carefully packed. No crushed or bruised or partly-decayed berries are allowable; a whole lot may be tainted by a single berry. Grapes lose much flavour and taste in cold storage. The correct temperature is from 32° to 40° F.

Apples may be kept either in barrels or boxes or in bulk, it is said, with equally good results. Barrels, if kept in storage for any length of time, must be refilled, to make up for shrinkage, before being put on the market.

Opinions as to the best temperature for storing apples vary all the way from 30° to 40° F. The latter temperature should not be exceeded in any case. If the air in cold storage is too dry, it wilts the apple, and if it is too damp it cracks and scalds them, especially if the temperature is not low enough. Experiments made by the United States Agricultural Department on the storage of apples, teach, among other things, that apples should be picked when fully grown and highly coloured, except certain varieties, which are liable to overgrow, and which may need picking a little earlier. As soon as possible after picking, apples should be put in cold storage, especially in warm weather, and the most favourable storage temperature is at 31° to 32° F. If stored for any length of time, apples should be placed in closed packages, as ventilated packages are liable to do injury by wilting. After removal from storage, apples should be kept at as low a temperature as practicable. The danger of scald is greatest with fruits stored in an immature condition and at a high temperature.

Asparagus, *Cabbage*, *Carrots*, *Celery* are carried with little humidity: parsnips and salsify, same as onions and potatoes, except that they may be frozen without detriment.

Cabbage should be stored in crates about 2½ feet in height, and piled on shelves about 2 feet apart, in order to secure a good air circulation. Late planted cabbage which has closed heads just before frost, is best adapted for cold storage. Artificial drying of the room is advisable. Temperatures from 31° to 36° F. are advised for cabbage, but 31° F. is considered best, and will keep cabbage from fall until spring with comparatively little shrinkage.

Celery may be kept at 32° to 34° F. for several months, according to variety and treatment; dressed, *i.e.*, trimmed celery, for a few days only.

Onions, if sound when placed in cold storage, can be carried several months, and come out in good condition. It is important that the onions be as dry as possible when put into cold storage. If they can be exposed to a cool dry wind, they will lose much of their moisture. They are usually packed in ventilated packages, crates, or trays. It is claimed, however, that they will keep well in sacks, if the sacking is not too closely woven, and are stored in tiers so that the air has free access. Authorities differ as to the best temperature at which to keep the onions, the range being from 30° to 35° F.; but 32° to 33° F. seems to be generally preferred. The rooms should be ventilated, and have a free circulation of dry air.

Onions should not, of course, be stored in rooms with other goods. When the onions are removed, the rooms should be well aired, thoroughly scrubbed, and after the walls, ceiling, and floor are free from moisture, should be further purified and sweetened by the free use of lime or whitewash; and a good coat of paint or enamel paint would be advantageous, after which the rooms can be used for other goods. There is no difficulty experienced in keeping onions in cold storage for six or seven months, and having them come out in perfect condition, if they were originally sound and properly dry.

STORAGE Temperatures for various Goods.

	° F.		° F.
Canned Goods—		*Fruit* (continued)—	
Fruits	35	Grapes	32-40
Meats	35	Lemons	36-45
Flour and meal—		Oranges	36
Corn meal	40	Peaches	35-45
Oatmeal	40	Pears	33-36
Wheat flour	40	Water-melons, carrying about three weeks	32
Miscellaneous—		*Vegetables*—	
Cigars	35	Asparagus	34
Furs, woollens, &c.	25-32	Cabbage	32-34
Furs, undressed	35	Carrots	33-34
Game to freeze—long storage	0-5	Celery	33-35
,, after frozen—short storage	25-28	Dried beans	32-40
Hops	33-36	,, corn	35
Honey	36-40	,, peas	40
Nuts in shell	35-38	Onions	32-34
Poultry after frozen—short storage	28-30	Parsnips	33-34
Poultry to freeze—long storage	5-10	Potatoes	34-36
Tobacco	35	Tomatoes	34-35
Fruit—		*Fish*—	
Apples	30-40	Dried fish	35
Bananas	34-36	Fresh	25-30
Berries (fresh) for three or four days	34-36	Oysters	33-40
Dates, figs, &c.	34	,, in shell	40
Dried fruits	35-42	,, in tubs	35

Freezing Rabbits.

On this subject Mr. Inspector Bradshaw, of the New South Wales Government Cold Storage Branch, says:—"The crate now in use, which is the result of several years' experience, although more difficult to freeze than those originally used, has the advantage of carrying more carcasses to the ton than any of the previous ones, while that great dread of all cold stores—mould—is now rarely seen. The case, for holding twelve pairs of large rabbits 2½ lb. each and over, is flat, being but 6 inches deep, 33 inches long, and 17 inches wide, approximately, 2 cubic feet in size. The top and bottom are 3-inch thin boards, with about the same space between each."

To ensure soundness, each carcass has to be specially examined by those having experience of the product, for, to the unskilled, a fresh rabbit and one termed sweaty, are much alike in appearance. The latter term refers to a stage when the carcass is just turning, and, when packed tightly and placed in cold storage, may became unsound before the cold penetrates the centre of the package. The carcasses are placed two deep in the box, the first row on their backs, with heads at each end of case, and legs meeting in the centre of the case, the upper row being reversed, thus leaving the furred side of the carcass exposed on the two sides, a circumstance which, with the close packing, is responsible for rabbits being the most difficult of all products to freeze. The thick fur carries into the freezing-rooms a quantity of the air of the same atmospheric heat obtaining outside the chambers, and this has all to be driven out before the 2 feet of solid flesh benefits from the refrigeration, this fact warranting a lower temperature than is necessary for any other meat.

In the first year or two of rabbit freezing, this feature was scarcely realised. The cases could be seen stacked as closely in the freezing-chambers as any other goods. Later experience showed that the lower temperature was not sufficient to get the best results, the manipulating of the cases in the freezing-rooms being of additional importance. In other words, in a freezing-room stocked solidly full of cases of rabbits at zero temperature, some in the centre might go stale, sour, or even mouldy before freezing, while, if stacked in what may be termed the orthodox way, a temperature of 10° or 12° F. will do more even and correct work.

The system now usually adopted is to commence at the lower end of the freezing-room, stacking the cases on their sides four or five deep, and leaving, say, 3 inches between each row, this being continued at each side of the room, leaving a working space in the centre. With this system there is always an apparent great waste of space, but such is not actually so, seeing that the temperature need not be so low as if stacked more densely, while they will freeze quickly, and can then be stacked away in the store-room for further work.

Under the above system of stacking in the chambers, about one-half of the actual chamber space is utilised, a 5,000-feet capacity room being thus capable of freezing, say, 2,500 feet of case rabbits, or 1,250 of the standard 2-feet cases. In a temperature of 10 or 15 degrees, 1,250 of these cases should be frozen hard enough for the store-room, or shipping under a fortnight, while if packed more densely, the freezing will be slower.

It is claimed for some description of goods that too quick freezing is not beneficial to the products. Such, however, cannot apply to rabbits, for no matter how low the temperature, some time is required before the frost penetrates the carcass.

It is always absolutely necessary that rabbits intended for preservation by freezing should be forwarded from the country to the freezing works or store under the most favourable method of packing that is possible. The rabbits should be clean, fresh, and white in the flesh. The whiteness of the flesh can only be obtained by properly bleeding the rabbits, which is done by making a small slit behind the ear as soon as the neck is broken.

Experts are of opinion that the inside of the rabbit should not be removed until about ten minutes have elapsed, otherwise the rabbits will get red or discoloured; on the other hand it is not advisable to leave the inside too long, or discolouration will take place. Great care should be taken not to break the paunch; the bladder, &c., should also be removed carefully. Do not remove the kidneys, and in favourably cold weather the liver may also be retained.

Poultry for Export.

In connection with the export of poultry from New South Wales, the official grade sizes as laid down by the Agricultural Department some time ago were as follow :-

Poultry for Britain.—Grade 1.

Choicest,	4 lb. and over.		Goslings,	9 lb. and over.	
Prime,	3½ ,,	,,	Turkey gobblers,	12 ,,	,,
Standard,	3 ,,	,,	Turkey hens,	8 ,,	,,
Ducklings,	4 ,,	,,			

All poultry must be young, from (say) 3 to 5 months old, and not under 3½ lb. live weight. The weight alone will not constitute quality, but the birds must bear evidence of having been well-fed and be well-fleshed. Large framed bony fowls and old birds will be rejected.

Ducklings must be from 10 to (say) 14 weeks old, and weigh not less than 4½ lb. live weight. The 10-weeks old ducklings are the best; being free from pin feathers, their appearance is better.

Goslings for the British market should be 10 lb. each and over alive.

Turkeys.—Gobblers must not be over 10 months old, and should weigh not less than 13 lb.; hens not under 9 lb. live weight.

Poultry for South Africa and the East.—Grade I.

Boiling fowls,	3½ lb. and over.	Mixed poultry,	3½ lb. and over
Prime chickens,	3 ,, ,,	Prime ducks,	3¾ ,, ,,
Prime cockerels,	2¾ ,, ,,	Ducklings,	3½ ,, ,,

Mixed ducks and ducklings, 3½ lb. and over.

Hens should be plump, and each weigh up to 4 lb. and over alive.

Young fowls, not less than 3½ lb. each alive.

Ducklings and ducks should weigh not less than 4 lb. each alive, and be well conditioned.

Geese and goslings, not less than 10½ lb. each alive, and hens 8 lb.

Packing.

The following are the numbers usually packed in cases for export in New South Wales, and shippers would do well to regulate their consignments accordingly:

Fowls and ducklings	12 or 15 or 25	in a crate.
Goslings	12	,,
Turkeys	8	,,
Hares ...	12	,,
Rabbits	24	,,
Skinned rabbits	30 and 36	,,

Measurement of Crates.

Crate	Measurement.	Cubic Measurement.	Number to ton shipping
	—inches—	ft. in.	crates (about)
Hare, crates ...	20 x 29 x 10	3 4	12
Poultry (15's) ...	28 x 14 x 7	1 7	25
,, A ducks (12's)	33¼ x 20½ x 5	2 1	19
,, A fowls (12's)	28¾ x 18¾ x 5	1 7	25
,, ,, 6 inch	29 x 24 x 7	2 10	14
,, ,, 7 ,,	29 x 24 x 8	3 3	12
,, ,, 8 ,,	29 x 24 x 9	3 8	11
Flat rabbit crates, special	33 x 18 x 6	2 1	19
,, ,, large	33 x 17 x 6	1 11	21
,, ,, young	32 x 15 x 6	1 8	24
,, ,, small	30 x 14 x 5	1 3	32
Skinned rabbits (30's and 36's)	28 x 14 x 7	1 7	25
Butchers' sundries, crates	27 x 18 x 10	2 10	14
Kidney, crates...	20 x 10 x 10	1 2	34

Frozen Pork, Ham, Bacon, and Fish.

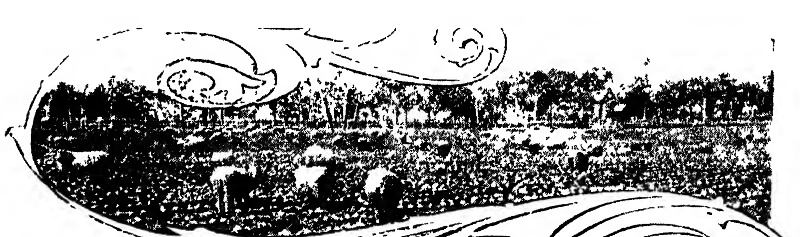
While the advent of the refrigeration process for preserving meats has been of very great utility in the handling and disposal of large quantities of beef and mutton in British and other markets, it has also been of valuable additional assistance in places where a hot climate made the business of dealing with the disposal of hogs a somewhat difficult work.

In this State, however, there is great scope for the further development of the frozen pork, ham, and bacon industry, and the comparative cheapness of refrigerating plants for the small as well as the large factory, places refrigeration within the scope of operations of small co-operative societies.

In like manner, if the fisheries of the State are to be more fully developed and thoroughly worked along our coast-line, then refrigeration will be a factor assisting in the development of small fishing communities which may yet be established at various points.

The satisfactory classifying or grading of eggs into suitable cases for market and the holding of same in cold storage is another class of business which has not been taken up in that thorough and business-like manner which one might expect in communities composed of keen and practical business men of the farming fraternity, notwithstanding that a little addition in the matter of accommodation at dairy factories would materially assist in the development of the egg industry.

In the absence of other methods, the storing of maize and other grain, and seed, in cold stores, is also an excellent means of holding over seed required for special purposes.



Some Results of the Experiments with European Grape Vines Grafted on Phylloxera-resistant Stocks.

At the Viticultural Station, Howlong.

M. BLUNNO.

The accompanying tables refer to the results obtained from some experiments carried out at the Viticultural Station, Howlong, where a number of the principal varieties of wine-grapes, a few table-grapes, and three raisin-grapes are grafted on various phylloxera-resistant stocks.

Each variety grafted on a stock has the same corresponding number of vines along the same row, which are not grafted and are designated in these tables "Witness." Therefore, the word "Aleatico" in the table of Rupestris du Lot means Aleatico grafted on that stock, while the following word "Witness" means the same Aleatico, but not grafted. This disposition I adopted in planning out the experimental plots in order to test the affinity of a given variety with a given resistant stock. By affinity is meant the readiness with which the vine and the stock graft and form a whole, having the root system resistant enough to defy the attacks of phylloxera, and the portion above ground representing any fruit-bearing variety, be it Aleatico, Cabernet, Syrah, &c.

The readiness to take the graft is not the first and only indication of affinity, otherwise it could be settled a year or two after the graft. Affinity means the mutual influence between stock and scion, whereby vines thus grafted not only form a good strong plant, but also bear good fruit for quantity and quality for quite a number of years, just like the same non-resistant vine not grafted.

The vine stocks experimented with are planted in soils of different texture, and as suitable to each stock as it was possible to find in a limited area of 60 acres. The ground in such area varies from pure sand to very stiff clay, but no one could expect every plot to be planted in a soil typical and representing the desiderata of texture, fertility, and moisture required by every kind of stock, unless we made up the soil of 4 or 5 acres to a depth of 4 or 5 feet.

The Riparias are in a sandy soil, but the soil towards the end of that plot gets a little bit stiff for them, also the Riparia x Rupestris, 3,306, Riparia x Rupestris, 3,309, and Riparia Rupestris, 101^{14}, are in ground inclined to be too heavy for them; the others are in soils approaching more to their requirements.

The comparative crops for four consecutive years—1904–1907—are reported for five out of nine stocks, and it will be seen how they vary, sometimes being in favour of the witness vine, some others in favour of the grafted ones.

For each European variety there are fourteen vines not grafted (witnesses), and fourteen of the same variety grafted on a certain stock. The crop borne by each group is calculated at the rate per acre, taking 537 vines per acre, planted 8 ft. x 10 ft. The results as to quantity of crop from a vine, whether grafted or not, depends a great deal on the pruning. To get results with mathematical accuracy, all the vines experimented upon should be pruned exactly alike, which is an impossibility. Of course, the system adopted is the same all through, viz., two bearing canes with spurs, but we know that, apart from the number of eyes left on each cane, which could easily be made equal for every vine, much depends on the position of such buds, on the bend given to the cane on the wire, and even a twist, or curve more or less pronounced, nearer or farther from the junction with the old wood, will make a difference as to quantity of crop. On paper the various vines grafted and not grafted could be drawn as to be pruned exactly alike; in nature we can only get approximately near to equality, but the difference between approximate equality and absolute equality is sufficient to give a wide range of differences in quantity of crops. The reader, therefore, in scanning these tables, will have to be satisfied with the evidence that vines grafted on those nine kinds of phylloxera-resistant stocks, taken all round, crop as well as when they are grown on their own roots, and any variation, some year in favour of the grafted vines, some other in favour of the witness vines, is independent of the fact that they are grafted or not.

Scanty data are to be found about the Sultana, as we found that it does not graft well with the phylloxera-resistant stocks, although information received by one vinegrower would show that it does fairly well on Rupestris Metallica. No information is obtainable on the subject from the home of Sultana, because that is about the only vine-growing country so far free from phylloxera.

In the above experiments wine-grapes prevail in number. There are a few table-grapes only. For these, however, there are already the splendid results obtained from the vineyards in the counties of Cumberland and Camden, certifying to the quality of the crop, which is as sweet and of as good appearance as any ever produced on the vines not grafted. Bunches and berries in most cases are bigger, containing more juice, very sweet, and of good flavour; but when a vigorous growing stock like the Rupestris du Lot, for instance, which prefers a loamy soil, with gravel or bits of stones, inclined to be dry, is planted in a rich flat of alluvial soil, loose, deep, and fairly moist, then the vine grafted on it is likely, according to the variety of the scion, to either produce wood and leaves to the detriment of the crop, or produce an enormous yield, but the grapes are then likely to ripen unevenly,

and lack flavour. That is the reason why I always insist that applicants for phylloxera-resistant stock should submit samples of soil and subsoil, in order that I may judge the kinds most suitable. Very often vignerons apply for, say, Riparia Gloire de Montpellier and Riparia x Cordifolia-Rupestris No. 106⁸, intending to plant them side by side in the same ground, which, if it is suitable for one sort, cannot possibly be suitable for the other. Suitability of a stock to a certain soil does not mean vigorous growth of the plant only, but vigour enough with good grapes and a long life of the vineyard.

Preference was given in these experiments to pretty well all the wine-grapes grown in the State, in view of the situation of the Viticultural Station, Howlong, half-way between two important wine-growing districts, viz., Albury and Corowa, closely threatened by an outbreak of phylloxera, which, in fact, did occur last December, near Albury, nine years after the establishment of the station.

These trial plots were also established for a comparative test of the content of grape-sugar and acids in the crop from the grafted and from the non-grafted vines respectively.

What I said of the yields applies also to the percentage of the above-named constituents of the juice; sometimes the grafted vines bear a crop that is sweeter than that of the "Witness" vines, sometimes not; the same also applies to the acids.

Grape-sugar, as is well known, is composed of two sugars glucose and levulose. It was always admitted that these two sugars occurred in equal quantities in forming the saccharine matter of the grape-juice. All the polarimetric determinations made for the last four years on over 884 samples go to show that, whether the grapes came from grafted or from ungrafted vines, the quantity of levulose is almost constantly slightly superior to that of the glucose, and varies up to 10 per cent. of the quantity of the latter.

During fermentation, the glucose is first to be split up by the alcoholic yeast, then the levulose. Therefore, when wines are not quite dry, but still contain traces of sugar, that sugar is mainly, if not all, levulose.

Grafted on Rupestris du Lot.

	1906. Guyot's Saccharometer.	1906. Keen's Saccharometer.	1906. Acidity per thousand.	1906. Sugar by Fehling's liquor, per cent	1906. Temperature. (Fahr.)	1906. Glucose.	1906. Levulose.	Crops per Acre. 1904.	Crops per Acre. 1905.	Crops per Acre. 1906.	Crops per Acre. 1907.	1907. Acidity per thousand.	1907. Sugar by Fehling's liquor, per cent.	1907. Guyot's Saccharometer.	1907. Keen's Saccharometer.	1907. Temperature. (Fahr.)	1907. Glucose.	1907. Levulose.
								lb.	lb.	lb.	lb.							
1. Aleatico	36·	33·	8·	24·23	75	11·72	12·51											
Witness																		
2. Carbernet	28·5	27·5	4·5	24·33	75	11·78	12·55	2,565	3,938	1,933	5,907	7·1	25·34	26·	27	54	12·56	12·78
Witness	27·5	27·	5·7	25·80	81	12·80	13·	2,761	5,387	5,452	5,562	7·4	25·64	28·	29·	57	12·72	12·82
3. Lambrusquat	20·25	19·5	8·6	15·32	75	7·02	8·30	3,938	5,907	4,442	6,981	6·2	21·55	22·	24	57	10 28	11·26
Witness	25·25	24·5	5 7	22·38	81	10·93	11·45	2,440	9,666	7,070	6,485	7 6	23·30	24·	26·	57	11·52	11·78
4. Malbeck	27·5	26·5	5·7	20·36	75	9·79	10 57											
Witness	23·25	23·	6·4	18·14	81	8 82	9·32											
5. Mammolo	25·5	25·	5·	21·12	75	10·10	11·02	4,756	2,148	1,074	8,592	6	22·	22·	24·	57	10·80	11·20
Witness	25·	24·	4·6	21·48	81	10·54	10·94		10,364	3,676	6,526	5·6	25·64	25·	26·	57	12·36	13·28
6. Muscat Hamburg	26·25	25·25	4·4	24 12	68	11·60	12 52											
Witness	26·75	25·75	5	24·12	74	11 94	12 18											
7. Muscat Frontignac	34·	33·	6·8	28·60	68	14 12	14·48		3,275	3,222	4,027	7·5	28·96	33·	33·	57	14·70	14·20
Witness	28·25	27·25	4·9	26·14	74	12·64	13·50		6,609	3,759	3,580	8 6	25·25	26·	27·	57	12·04	13·20
8. Verdot	20·5	20·	6·6	18·22	75	8·71	9·51	8,055	4,149	2,685	6,444	7·	28·24	28·	29·	56	14·08	14·16
Witness								5,056	9,666	6,609	5,728	7·3	21·54	21·	23·	56	10·54	11·
9. Syrah									5,370	2,685	3,490	7 7	30·82	33	35·	56	16·46	14·36
Witness	28·	27	6·2	23·75	74	11·70	12·05		8,353	5,955	10,605	7·7	25 78	27·	28·	56	13·12	12·46
10. Gordo Blanco	28·	27·	5·4	23·76	74	11·33	12·43											
Witness	23·5	23·	6·2	20·00	74	9·44	10·56											
11. Verdelho	28·	27·	6·1	22·80	66	11·32	11·48		5,370	1,074	4,833	7·5	24·62	29·	30·	57	12·48	12·12
Witness	29·5	28·	5·8	28·60	74	13·88	14·72		5,799	8,445	4,027	7·7	29·60	29·	31·	57	14·60	15·
12. Pedro Ximenes	26·	25·	8·	20·42	74	9·44	10 98	3,222	5,728	3,401	4,967	6·9		23·	25·	59		
Witness								2,454	10,740	4,172	6,981	7·0		27·	26·	59		
13. Pinot Blanc	27·75	27·	5·3	24·03	66	11·46	12·57	1.396	2,685	1,790		7	29·94	33·	31·	59	14·92	15·02
Witness	24·5	23 5	5·9	21·69	74	10·18	11·51	1,133	4,671	2,782	4,081	7·1	26·98	29·	30·	59	13·32	13·66
14. Shepherd's Riesling	28·75	28·	5 0	22 80	66	11·38	11·42	4,756	5,370	3,544	6,551	6·9	25·51	26·	27·	57	12·38	13·14
Witness	25·5	24·5	7·	20·60	74	9·86	10·74	3.102	5,452	6,151	5,638	8 8	26·31	27·	28·	57	12·70	13·61
15. Riesling	29·25	28·	8·5	24·92	66	11 44	13 48					6 5	25 90	27·	29·	57	12·46	13·44
Witness	30·75	29·5	5·9	28·00	74	13·75	14·25					7·3	25·64	25·	27·	57	12·36	13·28
16. White Shiraz	24·	23·	5·7	19·18	74	8·80	10·38		5,907	4.833	8,659	6·8	31·06	30·	31·	57	15·42	15·64
Witness	26·	25·	5 9	23·52	74	11·05	12 47		10,509	10,509	9,583	7 2	23·43	23·	24·	57	11·11	12·33
17. Sultana	26·5	25 5	4·6	23·75	74	10·88	12·87	1,342										
Witness	26·25	25·	5·4	23·52	66	10·64	12·88	1,342										
18. Thompson's Seedless	27·	26·	5·6	24·22	74	10·94	13·28	6,444										
Witness	27·	26·	5·3	25 75	65	11·72	14·03	4.206										

The chemical tests reported in these tables were made by Mr. A. L. Musso, Assistant to the Viticulturist. Mr. Musso, during the grape crop, stopped at the Viticultural Station, Howlong, and made the tests on the samples as they were picked.

Grafted on Riparia x Rupestris, 3,306.

1906.

	Guyot's Saccharometer.	Keen's Saccharometer.	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Temperature. (Fahr.)	Glucose.	Levulose.	Crops per Acre. 1904.	1905.	1906.	1907.
								lb.	lb.	lb.	lb.
1. Aleatico	25·25	25·	6	24·00	75	11·14	12·86	5.477	7,057	3,691	4,475
Witness	23·25	22·5	8·1	20·30	77	9·81	10·49	.	.	.	5,907
2. Cabernet	25·	24·	6·3	22·20	77	10·31	11·89	4,385	5,847	7,383	4,564
Witness	24 75	24·25	6·2	22·20	77	11·02	10·98	1,432	6,900	4,161	3.812
3. Lambrusquat	26·75	26·	5·5	23·80	77	11·80	12·	6,981	12,768	7,935	8.472
Witness	22·25	22·	7·1	19·46	77	9·76	9·70	4,756	6,883	5,056	9,800
4. Malbeck	25·25	24·50	5 3	21·71	77	10·49	11·22			2,148	4,027
Witness	26·	25·	5·5	21·92	77	10·88	11·04			.	4,027
5. Mammolo	23·5	23·	5·3	20·58	77	9·94	10 64	5,370	4,296	4,296	4,654
Witness	24·	23·5	5·2	20·27	77	9·85	11·03	12,458	5,370	4,883	12,216
6. Muscat Hamburg	23·	22·	7·4	20·41	66	10 02	10·39	..	.		..
Witness	24·	23·	5·4	21·44	66	10 40	11·04				
7. Muscat Frontignac	30·	29	4·9	24·60	68	12·24	12·36	4.296	10,049	4,892	4,175
Witness	25·	24·	4·8	21 66	66	10 64	11·02	2.685	4,296	2,215	4,117
8. Verdot	22·25	21·5	5·9	18·57	77	8·98	9·59	4,337	12,936	6,981	7,057
Witness	32·5	31·25	6·5	25·20	77	12·44	12·76	5,585	11,008	5,608	12,619
9. Syrah	31·	30·	6 6	27·06	75	13·76	13·30	2,362	7.518	7,048	4,475
Witness	31·5	30·5	7·6	23·86	74	12·	11·86	22,017		3,007	5,101
10. Gordo Blanco	20·	19·	6·2	17·82	75	8·38	9·44	5,071			.
Witness	23·	22·	6·8	22·05	74	10·76	11·29	3,965		.	....
11. Verdelho	27·	26·	6·1	22·85	66	11·38	11·47	8,592	10,847	3,436	
Witness	27·	26·	6·8	22·61	66	11·48	11·13	2,899	5,614	4,188	5,101
12. Pedro Ximenes	23·75	23·	9·6	20·37	75	9·63	10·74	1,253	8,771	3,759	5.584
Witness	"	38·	6·4	35·83	74	17·93	17·91	9,129	8,592	4,735	6,578
13. Pinot Blanc	26·	25·	5·7	22·05	66	10 58	11·47	3,818	5,262	5,614	4,081
Witness	28·5	27·	6 7	22·91	66	10·90	11·01	2,886	3,818	3,466	4,206
14. Shepherd's Riesling	23·	22·	4·7	18·71	68	8·90	9 81	8,592	3,962	12,730	7,211
Witness	24·	23·	6·1	20·08	65	9 68	10·32	5,504	5,948	7,146	8,144
15. Riesling	29·	28·	7·	21 32	75	10·37	10·95	.	....	2,685	2,685
Witness	29·7	28·	7·3	26·44	66	13·16	13·28			2,685	
16. White Shiraz	19·	19	8·8	17·32	75	8·29	9 03	8.256	13,357	12,995	7,303
Witness	22·	21·5	6·5	20·88	74	9 85	11·03	2,983	11,545	10,079	7,211
17. Sultana	27·75	26·5	6·6	25·34	74	11·90	13·44	2,148	.		.
Witness	27·75	26 5	6·1	23·80	74	11·11	12·79	4.027			
18. Thompson's Seedless	26·75	26·	7·8	25 50	74	11·89	13·61	6,041		.	
Witness	24 5	24·	5·9	21·66	74	9 99	11·67	8.103			
19. Tokay			.			.	....		.	.	..
Witness				..	.			.		..	

1907.

	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Guyot's Saccharometer.	Keen's Saccharometer.	Temperature. (Fahr.)	Glucose.	Levulose.
1. Aleatico	9 3	23·30	24·	25·	70	10·49	12·81
Witness	9·7	25·48	26·	27·	70	11·87	13·61
2. Cabernet	6 7	25·60	27·	28·	70	12·52	13·08
Witness	6·1	28 08	28	30·	63	13·56	14·52
3. Lambrusquat	6·9	21·80	21·5	23·	63	10·34	11·46
Witness	7·8	17·14	19·	21·	63	8·	9 14
4. Malbeck	7·	23·82	24·	25·	63	11·56	12·26
Witness	4·1	22·32	23·	24·	63	10·84	11·48
5. Mammolo	4·6	26·60	27·	28·	59	12·48	14·12
Witness	5·7	23·20	24·	25·	59	11·26	11 94
6. Muscat Hamburg	..				.	...	.
Witness							
7. Muscat Frontignac	8·3	29·10	28·	30·	59	13·32	15·78
Witness	9·2	30·30	22·	31·	59	13·94	16 36
8. Verdot	6·4	22·32	23·	25·	59	10·58	11·74
Witness	5·1	24·76	24·	26·	59	12 38	12·38
9. Syrah	6 4	26·32	28·	31·	57	13·36	12 96
Witness	7·3	26·46	27·	30·	57	13·30	13·16
10. Gordo Blanco					.	..	..
Witness					..	.	.
11. Verdelho	7·	26·04	26·	28·	59	13·04	13·
Witness	7·3	25·38	28·	30·	59	12·72	12·66
12. Pedro Ximenes	6·1	20·16	20·	22·	59	9·78	10·38
Witness	6·	23·70	26·	27·	59	11·62	12·08
13. Pinot Blanc	6·7	23·	26·	27·	61	11·12	11·88
Witness	7·	25·06	28·	30·	61	12·	13·06
14. Shepherd's Riesling	6·9	24·5	26·	27·	54	11·12	13·38
Witness	9·	27·	27·	28·	54	12·98	14·04
15. Riesling	5·4	19·64	21·	22·	57	9·33	10·31
Witness	6·8	21·20	22·	23·	56	10·40	10·80
16. White Shiraz	7 7	20·06	20·	22·	56	9 44	10·62
Witness	5·6	23·70	24·	26·	56	11·48	12·22
17. Sultana					..	..	
Witness							
18. Thompson's Seedless		..		..	.	.	..
Witness	..	...	..	..	.	...	.
19. Tokay	.	26·32	26·	27·	56	13·84	12·48
Witness	.	19·44	20·	22·	56	9·37	10·07

Grafted on Riparia Gloire de Montpellier.

	1906.							Crops per Acre.				1907						
	Guyot's Saccharometer	Keen's Saccharometer	Acidity per thousand	Sugar by Fehling's liquor per cent	Temperature. (Fahr.)	Glucose.	Levulose	1904.	1905.	1906.	1907.	Acidity per thousand.	Sugar by Fehling's liquor. per cent.	Guyot's Saccharometer.	Keen's Saccharometer.	Temperature. (Fahr.)	Glucose.	Levulose.
								lb.	lb.	lb	lb.							
1. Aleatico	22·	21·5	7·6	20·	68	9·30	10·70	5,700	5,989	5,370	4,430	7·5	24·74	25·	27·		11·54	13·20
Witness	29·75	29·	8·3	27	68	13·08	13·92	5,907	5,799	4,564	4,229	7·6	27·20	27·	28·		12·62	14·47
2. Cabernet	22·25	21·5	6·3	23·05	68	11·40	11·65	5,155	3,807	5,370	3,043	7·4	22·90	23·	25	61	11·06	11·84
Witness	24·25	23·5	6·5	22·60	68	10·95	11·65	2,880	4,641	5,414	4,057	6·1	23·72	24·	25·	63	10·60	13·12
3. Lambrusquat	20·5	20·	7·9	19·08	68	9·36	9·72	6,742	7,935	5,593	4,526	10·2	18·72	19·	20·	57	9·08	9·64
Witness	20·	19·5	8·3	16·80	68	8·22	8·58	4,992	8,178	7,476	5,280	7·7	20·38	21	22·	57	9·78	10·40
4. Malbeck	18·5	18·5	5·1	19·11	68	9·45	9·66											
Witness	24·	23	4·8	20·60	70	10·19	10·31											
5. Mammolo	20·75	20·5	5·1	19·00	68	9·20	9·80	12,888	4,296	5,370	4,631	8·3	21·64	22·	24·	57	10·64	11·03
Witness	22·5	24·5	5·1	21·02	72	10·38	10·64	10.544	7,187	9,800	6,175	6·2	19·84	19·	21·	57	9·80	10·04
6. Muscat Hamburg	24·	23·	6·3	19·00	75	9·26	9·74											
Witness	26·	25	5·7	22·80	75	11·48	11·32											
7. Muscat Frontignac	24·5	24·	5·	21·64	75	10·56	11·98	1,074	6,354	3,759	2,148	7·3	24·76	25	27·	57	11·74	13·02
Witness	27·5	26·5	5	23·54	77	11·52	12·02	1,718	5,280	3,807	2,685	6·3	30·50	31·	33	57	15·06	15·44
8. Verdot	17·	17·	7·3	15·34	68	7·44	7·90	7,697	10,068	8,426	5,760	9·	20·00	22·	23	57	9·72	10·28
Witness	21·75	21·5	6·6	20·40	72	9·95	10·55	7,194	9,958	9,845	6,175	6·5	18·12	19·5	21·	57	8·86	9·26
9. Syrah	27·	26·	8·6	23·10	77	11·52	11·58	1,611	1,790	3.222	3.490	6·2	25·24	25	27·	57	13·06	12·18
Witness	24·	28·	6·2	24·25	74	12·00	12·25	3,298	4.430	4.641	4,510	6·3	24·28	29·	30	..	12·16	12·14
10. Gordo Blanco	18·5	18·5	5·8	16·60	74	7·68	8·92	5,730										
Witness	24·	23·	7·2	20·60	75	9·92	10·68	9,397										
11. Verdelho	24·25	23·5	8·3	20·70	75	10·16	10·54	10.126	3,960	2,506	3,356	7·3	25·90	28	29·	57		
Witness	19·5	18·5	6·5	15·30	74	7·22	8·08	3,803	5,178	4,130	4,296	6·6	27·58	27·	28	57	14·02	13·56
12. Pedro Ximenes	23·	22·5	7·8	22·46	77	11·01	11·47	2,953	7,876	6,309	3,580	8·1	17·70	18·	19	57	8·84	8·86
Witness	27	26·	6·7	23·66	74	11·28	12·38	2,864	5,414	5,246	3,960	5·9	23·14	24·	25·		10·86	12·28
13. Pinot Blanc	22·5	22·	6·3	18·50	75	8·46	10·04	2,028	5,370	5,262	3,375	7·2	23·82	24	26·	65	11·34	12·48
Witness	24·5	23·5	6·3	19·18	75	8·80	10·38	4,393	4,794	5,858	4,833	7·5	18·66	22·	23·	65	8·80	9·86
14. Shepherd's Riesling	19·5	19·	6·3	16·80	75	7·72	9·08	4,564	9,487	11,008	3,878	7·	20·16	22·	23·	65	9·48	10·68
Witness	24·	23·5	5·3	19·30	75	9·14	10·16	5,501	5,862	8,426	5,600	7·3	25·38	26·	27·		12·12	13·26
15. Riesling	27·5	26·5	6·1	21·20	75	10·48	10·72		9,934									
Witness	16·25	16·	6·7	12·30	74	5·44	6·86		8,368									
16. White Shiraz	22·25	22·	6·4	21·00	79	9·80	11·11	5,459	9,934	11,500	4,247	7·6	19·72	20	21	65	9·20	10·52
Witness	22·5	22·	6·9	19·08	74	8·98	10·10	4,967	8,368	10,642	4,094	7·5	20·72	22·	25·	63	9·96	10·76
17. Sultana	24·75	24·	8·2	20·16	79	9·48	10·68											
Witness	28·	27·	6·	26·88	74	12·43	14·45											
18. Thompson's Seedless	26·	25·	6·3	22·66	79	10·88	11·78	3,356										
Witness	31·5	30·	6·5	24·94	74	11·84	13·10	8,715										
19. Tokay																		
Witness																		

Grafted on Riparia x Rupestris, 3,309.

	1906. Guyot's Saccharometer.	1906. Keen's Saccharometer.	1906. Acidity per thousand.	1906. Sugar by Fehling's liquor, per cent.	1906. Temperature (Fahr.)	1906. Glucose.	1906. Levulose.	Crops per Acre 1904.	Crops per Acre 1905.	Crops per Acre 1906.	Crops per Acre 1907.	1907. Acidity per thousand.	1907. Sugar by Fehling's liquor, per cent.	1907. Guyot's Saccharometer.	1907. Keen's Saccharometer.	1907. Temperature. (Fahr.)	1907. Glucose.	1907. Levulose.
								lb.	lb.	lb.	lb.							
1. Aleatico	22·5	22	8·25	20·16	77	9·12	11·04	3,177	3,368	4,296	5,429	10·6	23·92	24·	25·	56	10·92	13·
Witness	24·25	23·75	7·0	21·48	77	10	11·48			2,148	5,012	8·7	24·64	25·	27·	56	11·11	13·53
2. Cabernet	26·	25	6·7	22·70	77	10·84	11·86	2,932	4,393	4,057	5,155	7·9	23·94	24·	26·	56	11·86	12·08
Witness	26·75	26·	5·9	24·70	77	12·03	12·67	1,432	2,538	3,469	4,236	6·4	24·18	24·	26·	56	12·	12·18
3. Lambrusquat	21	20·5	7·	18·64	77	8·82	9·82	6,981	5,807	4,956	4,779	10·8	22·	22·	24·	57	10.66	11·34
Witness	20·25	20	7·6	17·38	81	8·22	9·16	3,020	6,942	6,030	6,248	6·9	23·72	22·	24·	65	11·50	12·22
4. Malbeck	23·	22·	7·4	20·80	77	9·64	11·16			.	5,139	5·5	23·	23·	24·	65	11·	12·
Witness	23·50	23	6·1	22·12	81	10·91	11·21	.		...	4,833	5·	27·62	27·	28·	56	13·72	13·90
5. Mammolo	26·5	25·5	5·4	23·26	77	11·08	12·18	7,322	4,540	3,563	8,220	5·8	21·80	21·	23·	56	10·46	11·34
Witness	23·25	22·	6·4	21·78	81	10·74	11·04	1,611	4,967	8,457	9,167	5·2	24·24	24·	25·	57	11·88	12·36
6. Muscat Hamburg	26·75	25·5	5·5	22·82	72	10·61	11·21			.	.	....	...	....	...	..	....	....
Witness	22·75	22	6·2	19·63	72	9·54	10·09		.	.	..	....	..	..	....	.	....	....
7. Muscat Frontignac	33·	32·	8·	26·14	74	12·20	13·94	2,470	3,356	2,608	6,265	10·3	25·90	24·	26·	66	11·86	14·04
Witness	26·25	22·5	6	23·06	72	11·10	11·96	1,074		3,544	1,917	7·9	34·48	34·	34·	66	17·02	17·46
8. Verdot	18·5	18·5	5·8	18·	77	8·68	9·32	3,651	6,688	4,461	6,559	9·6	21·56	23·	24·	66	10·48	11·08
Witness	28·75	27·5	6·	26	81	13·02	12·98	5,370	5,235	4,176	4,922	7·5	20·38	20·	22·	66	10·01	10·37
9. Syrah	22·75	22·5	4·7	21·50	77	10·18	11·32	5,907	3,973	4,833	7,518	8·9	25·64	27·	28·	66	13·12	12·52
Witness	30·5	29·	6·5	26·63	77	13·26	13·37		3,883	5,418	4,296	7·1	26·74	30·	32·	66	13·82	12·92
19. Gordo Blanco	25·5	25	6·7	22·88	77	10·84	11·96			.	....	..	..	..	...	.	...	....
Witness	23·75	23·	5·6	20·80	72	9·70	12·10			..	....	..	....	..	....		....	..
11. Verdelho	27·75	27·	6·8	25·38	72	12·40	12·98	4,491	4,430	3,281	7,339	9·0	24·68	26·	27·	59	12·10	12·58
Witness	27·25	26·5	6·2	25·24	72	12·50	12·74	4,833	4,534	4,430	3,222	7·4	24·82	26	28·	59	12·14	12·68
12. Pedro Ximenes	..	.		.					8,592	2,565	6,265	8·6	22·2	23·	25·	59	10·54	11·66
Witness	24·25	24·	7·0	22·26	72	10·43	11·83	.	6,645	6,151	5,745	9·6	24·5	25·	26·	59	12·	12·50
13. Pinot Blanc	26·75	26·	7·1	20·84	72	10·25	10·59	.	. .	3,639	6,336	7·6	24·04	26·	28·	59	11·46	12·58
Witness	23·5	23·	7·5	21·74	72	10·08	11·66	.	...	5,638	4,940	7·7	25·26	26·	27·	59	12·14	13·12
14. Shepherd's Riesling	25·25	24·5	5·7	20·45	72	9·74	10·77	2,685	5,504	2,577	8,001	9·5	20·40	29·	31·	59	14·	15·40
Witness	26·25	25·	6·3	22·70	70	11·01	11·69	2,148	7,709	8,220	6,482	9·2	27·62	26·	27·	59	13·40	14·22
15. Riesling	26·25	25·5	7·	21·90	72	10·51	11·39		2,148	...	3,222	7·1	25·34	24·	25·	65	12·	13·34
Witness	27	26·	8·9	23·06	72	11·22	11·84		2,685	. .	3,222	7·2	23·00	25·	26·	65	11·	12·
16. White Shiraz	20·5	21·	6·5	20·	77	9·26	10·74	3,580	7,938	9,861	11,366	8·4	21·30	22·	23·	65	10·	11·30
Witness	20·5	20·	6·6	19·37	74	8·70	10·67	4,149	10,391	11,521	7,697	6·0	23·74	25·	26·	65	11·18	12·56
17. Sultana	.		.	..		..	..	.			..	.	...		.		..	....
Witness	24.5	24	5·7	22·66	74	10·40	12·26	.										
18. Thompson's Seedless	25·75	25·	5·9	22·87	77	10·21	12·66	2,819	.								.	.
Witness	26	25·5	5·6	24·22	74	11·26	12·96	8,250										
19. Tokay				.		.		.			..							.
Witness																..		

Grafted on Riparia x Rupestris 101[14].

	1906.											1907.						
	Guyot's Saccharometer.	Keen's Saccharometer.	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Temperature. (Fahr.)	Glucose.	Levulose.	Crops per Acre 1904.	Crops per Acre 1905.	Crops per Acre 1906.	Crops per Acre 1907.	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Guyot's Saccharometer.	Keen's Saccharometer.	Temperature. (Fahr.)	Glucose.	Levulose.
								lb.	lb.	lb.	lb.							
1 Aleatico	24·5	24·	6·	22·67	66	10·53	12·14	2,685	4,355	4,654	4,023	6 3	23·36	26	27·	65	11·48	11·88
Witness	32·25	31·	7·1	26 70	72	13·10	13·60	2,071	4,784	2,523	4,065	7·1	23·14	24·	25·	65	10·92	12·18
2. Cabernet	21·75	21·5	6·8	20·24	66	9·85	11·39	3,651	5,683	5,565	5,168	6·1	20·50	23·	25·	65	10·	10·50
Witness	24·25	24·	6 3	23·24	75	11 23	12·01	1,772	9,788	3,651	5,847	6 2	22·10	25·	27·	65	11·	11·10
3. Lambrusquat	16·5	16·	7·	13·65	68	6·54	7 11	8,293	12,172	11,880	6,309	5·3	21·42	22·	23·	65	10·54	10·88
Witness	20·	20·	6·9	17·41	75	8·35	9·06	5,181	9,170	5,728	7,476	7·1	21·20	22·	24·	65	10·36	10·84
4. Malbeck	23·25	22·5	7·	21 60	63	10·57	11 03	.		.							....	..
Witness	22·	21 5	6·4	20 05	75	9·76	10·69	.									....	..
5. Mammolo	21·5	21	5·1	19·40	68	9·51	10 89	8,055	4,631	6,336	5,817	6·1	23·36	25·	26	65	11·38	11·98
Witness	21·5	21·	5·4	20·80	75	10·15	10·71	9,827	7,931	6,346	8,484	6·1	21·06	22·	24·	65	10·12	10·94
6. Muscat Hamburg	21·	20·5	4·	17 15	74	8·05	9·10	.		.	..						....	..
Witness	19·25	18·5	5·5	16 47	63	7·85	8·62	.									....	
7. Muscat Frontignac	27·5	26 25	7·2	13 06	74	11·10	11·96	1,342	4,296	2,685	3,580	6 3	27·78	27·	29·	65	12·98	14·60
Witness	30·25	29·	5 7	26 44	66	12·66	13·78	1,611	5,523	2,752		7·8	26·46	26	28·	65	12·40	14·06
8. Verdot	19·75	19 5	8·2	17 72	68	8·38	9 34	2,953	10,620	7,195	4,735	5·1	25·38	25·	27·	61	12·46	12·92
Witness	19 75	19·5	6·1	17·60	75	8·68	8·92	4,881	8,250	5,565	5,783	7·1	22·60	25·	26·	61	11·06	11·54
9. Syrah ..	31·5	30·	8·0	27 10	68	13·32	13·78	8,055	4,967	6,981	5,504	9·7	23·36	26·	28	61	11·52	11·84
Witness	31 25	30·	6 7	29·06	74	14·15	14 91	6,014	5,907	5,784	3,651	8 4	26·74	29·	32·	61	13·34	13·40
10. Gordo Blanco	21·75	21 5	5·5	18·82	68	9·11	9·71	2,148		..			...	..	..	..	..	..
Witness	23·5	23·	5·9	21·26	75	10·16	11·10	9,039									....	..
11. Verdelho	25·	24·	6·6	18 16	74	8·59	9·57	6,904	7,070	5,571	6,041	8·	26 02	26·	28	63	12·54	13·48
Witness ..	27·5	26 5	5·8	25·92	70	12 50	13 42	5,600	6,242	4,602	3,580	6·9	23·74	28·	30·	63	12·94	13·80
12. Pedro Ximenes	22·5	22	7 0	18·60	66	8·60	10·00	6,981	5,235	4,296	3,973	5·2	21 42	24·	25.	63	10·32	11·10
Witness	26·25	25·5	8 0	22·26	74	10·33	11·88	6,597	8,055	8,010	7,978	5·	24·04	24·	26·	63	11·80	12·24
13. Pinot Blanc ..	23·	22·5	6·2	28·18	74	9·50	10·68	5,370	4,117	5,907	4,940	6·6	22·62	25	27·	63	10·66	11·96
Witness	22·5	22·	7·1	20 82	66	9·82	11·00	3,222	3,835	3,965	4,618	7·	25·24	27·	29·	63	12·46	12·78
14. Shepherd's Riesling	23	22·5	5·6	20·45	74	9·50	10·95	7,070	9,725	10,135	5,131	10·7	28 24	27·	29·	63	13·78	14·46
Witness	26·5	25 5	6·2	22 05	66	10·48	11·57	5,783	8,285	8,323	6,102	6·4	26·60	27·	29	63	13·20	13·40
15. Riesling	26·5	25 50	7·7	19·06	74	9 33	9·73	..	5,370	4,833	3,311	7·1	21·06	22·	23·	63	9·92	11·14
Witness	.	.	..		.	.			3,114	3,759	3,222	6·3	22·90	23	24·	63	10·86	12·04
16. White Shiraz	26·	25·	7·9	23·32	74	11·07	12·25	12,351	13,067	17,124	7,756	7 3	25·34	23·	24·	56	11 86	13·48
Witness	20	20	7·8	17·86	74	8·70	9 16	6,785	9,252	11,321	6,981	7·7	20·94	20	21·	56	9·66	11·28
17. Sultana			..					..								..		
Witness	25·25	25·	6·1	22·46	77	10·89	11·57	.		..						..		
18. Thompson's Seedless	25·	24·	6·2	21·52	68	10·50	11·02	5,549	..	.						.		
Witness	26·5	26·	5·1	24·40	77	11·68	12·72	9,046	.							.		
19. Tokay .	. .			.		.	.	..				.		.	.	.		..
Witness		. .	.					.			.					.	.	..

Grafted on Rupestris Martin.

1906.

	Guyot's Saccharometer.	Keen's Saccharometer.	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Temperature (Fahr.)	Polarimetric rotation.	Glucose.	Levulose.
1. Black Hamburg	20·5	20	4 6	20·0	68	10 22	9 23	10 77
Witness	23·5	23	4 2	22·20	68	10 54	10·30	11 90
2. Cabernet	27·5	26	6 2	24 46	74	10 46	11 76	12·70
Witness	27·5	27	7 5	25 0	68	10 54	12 19	12 81
3. Black Prince	27	26	6 7	21 30	66	10 12	10 11	11·19
Witness	23·	23	6·6	20·58	65	10 34	9 82	10 66
4. Malbeck	25·	24·	4 6	22 72	66	11 6	10 72	12·00
Witness	26·	25	4 7	24·70	65	11 22	11·92	12 78
5. Royal Ascot	26·75	26·	8 0	22 26	68	10 12	10·66	11·60
Witness	23 5	23·	4 7	22·97	65	1' 22	10·81	11·16
6. Muscat Hamburg	23 5	23·	6 2	19 76	68	9 24	9·36	10·40
Witness	29·	28·	3 4	26·56	65	12 20	12 78	13·78
7. Muscat Frontignac	27·	26·5	8·0	22 91	70	11 39	10 53	11·38
Witness	25·	24·5	8·1	22·66	65	11 16	10 67	11·99
8. Doradillo	21·	20·5	3 1	19 56	70	8 18	9 56	10·
Witness	21	20·5	3 6	19·37	65	8 12	9·61	9·70
9. Syrah	29·	28·	7 6	23 23	70	8 38	11·80	11·43
Witness	29·5	29·	6·4	27 50	66	9 6	14 46	13·04
10. Gordo Blanco	26·75	26·	5 2	22·50	70	10 10	10·80	11 70
Witness	22·5	22·	5·1	20 00	66	9 34	9 49	9·51
11. Verdelho	28·	27·	5·1	26·56	65	11 34	13·06	13·50
Witness	30·	28·5	5 9	27·14	68	11 34	13 34	13·80
12. Pedro Ximenes	29	28·	5·5	25·46	65	11 58	12 22	13·24
Witness	27·5	26·	8·4	24·21	68	11 58	11·34	12·88
13. Pinot Blanc	35·	33·	7 4	25·10	65	10 10	12 60	12·50
Witness	28·75	27·75	7·4	21 90	66	8 54	10·96	10 94
14. Shepherd's Riesling	30·	29	8·3	22·87	65	10 10	11·18	11·69
Witness	25·	24·5	6·9	22 06	68	10 30	10·45	11 61
15. Riesling	25·	24·	8·1	21·12	65	10 54	9 81	11·31
Witness	25	24·	7·8	20·42	60	10 50	9·49	10·93
17. Sultana			..					
Witness	25·	24·5	6·8	20·00	60	11 10	9·12	9 88
18. Raisin des Dames	24·	23·	6·5	21·24	66	9 4	10·48	10·76
Witness	20 5	20·	6·9	16·90	60	7 38	8·30	8·60
19. Tokay	32	30	5·2	29·76	68	13 12	14·45	15 31
Witness	24·5	24·	4·7	20 60	60	10 14	9 82	10·78
20. White Sherry	27·	26·	3·8	25·20	68	12 22	11·82	13·38
Witness	23 75	23·	4·4	20·80	60	10 22	9·90	10·90
21. Almeria	22·25	22	5·8	18·00	65	7 6	9·10	8·90
Witness	22·5	22	5·2	18·54	65	7 20	9·36	9 18

1907.

	Crops per Acre.	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Guyot's Saccharometer.	Keen's Saccharometer.	Temperature. (Fahr.)	Glucose.	Levulose.
	lb.					°		
1. Black Hamburg								
Witness								
2. Cabernet	3,812	7 5	24·50	27·	27·	57	12·32	12·18
Witness	4,242	6·6	24 66	26·	27	57	12·38	12·28
3. Black Prince								
Witness								
4. Malbeck	6,265	5 5	22·74	23·	25	57	11·00	11·74
Witness	9,845	5 4	24·67	23·	24·	57	12·02	12·65
5. Royal Ascot								
Witness								
6. Muscat Hamburg								
Witness								
7. Muscat Frontignac	3,528	6 4	31·06	33·	32·	57	15·26	15·80
Witness	4,843	6·1	32·46	32·	33·	57	16·44	16·03
8. Doradillo								
Witness								
9. Syrah	3,624	7 6	28·56	30·	31·	57	14·64	13 92
Witness	5,523	7·2		26·	27·	57		
10. Gordo Blanco								
Witness								
11. Verdelho	5,907	7 6	26 60	28·	28·	57	13·62	12·98
Witness	6,712	8 2	26·04	26·	27·	57	13·20	12·84
12. Pedro Ximenes	5,907	6·2	28·10	28·	30·	57	13·54	14 56
Witness	9,867	6·9	27·48	27·	28·	57	13 26	14·22
13. Pinot Blanc	6,444	8 6	25·00	27·	29·	56	12·34	12·66
Witness	..	7 8	22·32	24·	25·	56	10·76	11·56
14. Shepherd's Riesling	7,518	6·9	25·00	27·	28·	56	12·	12·50
Witness	7,410	7·2	24·04	25·	26·	56	12·32	11·72
15. Riesling		9·4	22·48	24·	25·	56	11·10	11·35
Witness	3.580	7·9	21·56	21·	22·	56	10·54	11 02
17. Sultana								
Witness								
18. Raisin des Dames								
Witness								
19. Tokay		8 1	26·04	25	26·	56	12·66	13·38
Witness	6,060	6	25·12	26·	27·	56	12·10	13·12
20. White Sherry								
Witness								
21. Almeria								
Witness								

Grafted on Rupestris Metallica. 1906

	Guyot's Saccharometer.	Keen's Saccharometer.	Acidity per thousand.	Sugar by Fehling's liquor, per cent.	Temperature. (Fahr.)	Polarimetric rotation.	Glucose.	Levulose.
					°	° ′		
1. Black Hamburg ..	21·5	21·	4·3	19·56	65	9 52	9·76	9·80
Witness	24·5	24·	4·5	21·72	65	10 4	10·48	11·24
2. Cabernet	26·25	25·25	6·7	24·46	65	11 28	11·75	12·71
Witness	29·	28·	6·6	23·30	65	10 20	11·40	11·90
3. Black Prince	20·5	20.	5 2	18·30	65	7 34	9·12	9·18
Witness	22·	21·5	5·6	20·16	63	9 20	9·76	10·40
4. Malbeck	19·5	19·	7·6	16·82	65	9 8	8·12	8·70
Witness . .	27·	26·	5·6	25·20	63	11 12	12·36	12·84
5. Royal Ascot	26·	25·	7·6	24·00	65	10 34	11·76	12·24
Witness	24·	23·	5·9	20·14	65	9 18	9·72	10·42
6. Muscat Hamburg ..	27·	26.	4·6	22·25	65	10 04	10·81	11·43
Witness	27·25	26·	3·8	25·46	65	11 28	12·39	13·07
7. Muscat Frontignac ..	26·5	26·	7·9	22·16	61	11 4	10·50	11·66
Witness	24·5	24·	7·7	22·90	65	11 28	10·75	12·15
8. Doradillo	21·	20·	3·4	19·00	61	8 20	9·39	9·61
Witness ..	21·5	21·	3·9	18·64	65	8 6	9·18	9·46
9. Syrah	28·	27·	7·5	22·5	63	10 2	11·03	11·47
Witness	29·	28·	7·2	24·22	65	9 44	12·18	12·04
10. Gordo Blanco .	25·5	24·5	5·2	22·25	63	10 34	10·68	11·57
Witness .	25·	24·5	5·2	21·86	65	10 10	10·53	11·33
11. Verdelho . .	33·	31·	8·0	27·75	63	12 58	13·41	14·35
Witness	29	28·	6·6	25·46	65	11 26	12 41	13·05
12. Pedro Ximenes ..	26·	25·	6 2	19 54	63	8 54	9·51	10 03
Witness .	22·	22·	7·2	19·56	61	10 36	8·98	10·58
13 Pinot Blanc	23·75	23 5	4·9	20 82	61	12 20	9·28	11 54
Witness ...	25·5	25·	7·5	21·50	61	12 42	9·52	11 98
14. Shepherd's Riesling ..	26·5	26	7·5	21·66	61	9 52	10·58	11·08
Witness . ..	28·	27·	7·7	24·22	61	11 14	11 76	12·46
15. Riesling	25·	24·	10·1	18·70	65	9 18	8·77	9 93
Witness ..	.	.		..		.	...	
16. Aucarot . ..	19·5	19·	10·3	15·10	65	7 20	7·16	7·94
Witness .. .	29.	28·	6·8	22·60	65	9 58	11 07	11·53
17. Sultana		...				.	...	.
Witness ..	26·	25	6·0	21·48	61	9 26	10 53	10 95
18. Raisin des Dames ..	20·	19·	5·7	18·14	65	7 0	9·22	9·08
Witness .. .	16·75	16·	5·2	14·36	65	6 48	7 55	6·81
19. Tokay	22·75	22·	4·6	21 48	65	7 56	11·04	10·44
Witness . . .	20·	20·	6·5	18·60	65	9 22	8·70	9·90
20. White Sherry . .	19·	19·	3·8	15·74	65	7 48	7·41	8·33
Witness ..	21·5	21·25	4 0	19·70	65	11 2	8·84	10·86
21. Almeria	17·75	17·5	6·4	14 00	65	5 16	7·16	6·84
Witness	22·	21·5	5·0	19·00	65	8 10	9·38	9 62

Grafted on Cabernet x Rupestris, No. 33.

	1906. Guyot's Saccharometer.	1906. Keen's Saccharometer.	1906. Acidity per thousand.	1906. Sugar by Fehling's liquor, per cent.	1906. Temperature (Fahr.)	1906. Polarimetric rotation.	1906. Glucose.	1906. Levulose.	1907. Crop per acre.	1907. Acidity per thousand.	1907. Sugar by Fehling's liquor, per cent.	1907. Guyot's Saccharometer.	1907. Keen's Saccharometer.	1907. Temperature. (Fahr.)	1907. Glucose.	1907. Levulose.
									lb.							
1. Black Hamburg	22·5	22	3·7	21·83	79	8 48	10·50	11·33	...	...	...	...	...	...	...	...
Witness	17·5	17	4·3	17·14	81	6 42	8·31	8·83	...	...	...	...	...	...	...	...
2. Cabernet	26	25	5·8	24·70	81	9 42	12·08	12·62	5,907	6·6	25·22	27·	27·	54	12·56	12·66
Witness	27·	26·	5	24·84	81	9 34	12·21	12·63	3,222	6·1	27·46	28·	29·	54	12·54	12·92
3. Black Prince	19·	18·5	6·3	16·00	74	7 6	7·66	8·34	...	...	...	...	...	...	...	...
Witness	20·	19·5	5·8	18·12	81	6 52	8·94	9·18	...	...	...	...	...	...	...	...
4. Malbeck	25·5	24·5	4·6	23·40	74	9 46	11·41	11·99	5,047	4·8	25·90	25·	26·	56	12·42	13·48
Witness	26·	25	4·	24·54	81	9 38	12·00	12·54	4,296	6·4	23·	24·	25·	56	11·48	11·52
5. Royal Ascot	18	18	5·4	17·32	74	7 18	8·48	8·84	...	...	...	...	...	...	...	...
Witness	..								...	...	...	...	...	...	...	...
6. Muscat Hamburg	23·5	23	4·7	22·07	79	8 52	10·76	11·31	...	...	...	...	...	...	...	...
Witness	28	27·	4·1	24·82	81	9 52	12·09	12·73	...	...	...	...	...	...	...	...
7. Muscat Frontignac	22·	21·5	6·3	19·48	77	9 32	8·86	10·62	3,624	7·4	32·26	32·	32·	63	15·82	16·44
Witness	22	22·	7·	19·70	81	9 42	8·99	9·71	..	6·7	31·44	33·	33·	63	15·72	15·72
8. Doradillo	20·	20	3·5	19·40	75	7 34	9·61	9·79	...	...	...	...	...	...	...	...
Witness	20	19·5	3·9	19·66	81	6 42	9·96	9·70	...	...	...	...	...	...	...	...
9. Syrah	29.	28	5·8	25·60	74	9 54	12·80	12·80	4,475	8·3	25·38	26·	27·	63	12·90	12·48
Witness	29	28·	6·6	26·0	81	9 26	12·98	13·02	4,161	6·7	28·57	30·	31·	63	14·54	14·03
10. Gordo Blanco	18·25	18·	4·7	16·32	75	8 40	7·28	9·04	...	...	...	...	...	...	...	...
Witness	21·	20·5	5·6	18·40	81	7 28	8·90	9·50	...	...	...	...	...	...	...	...
11. Verdelho	27·5	26·5	7·	25·16	75	9 34	12·56	12·60	3,750	9·3	28·90	28·	30·	63	14·52	14·38
Witness	23	22·	7·6	22·20	81	9 24	10·6	11·6	4,027	6·7	25·06	27·	29·	63	12·60	12·46
12. Pedro Ximenes	26·5	26	5·9	25·08	74	11 0	12·04	13·04	7,249	6·5	23·58	25·	26·	65	11·80	11·78
Witness	18·	18·	9·5	17·60	81	7 12	8·48	9·12	5,817	6·5	25·90	27·	28·	65	12·74	13·16
13. Pinot Blanc	30·	29	6·2	26·22	81	10 20	12·80	13·42	.	7·7	21·28	27·	28·	65	10·52	10·76
Witness	27	26·	7·1	23·86	81	11 16	11·06	12·80	2,506	7·4	25·26	28	29·	65	12·26	12·99
14. Shepherd's Riesling	26	25·	6·6	24·32	79	9 2	12·12	12·20	5,907	5·7	26·46	28·	28·	65	13·06	13·40
Witness	27·	26·	6·5	21·30	81	8 20	10·50	10·80	5,370	7·6	25·52	27·	29·	65	12·54	12·98
15. Reisling	23·	23·	7·5	19·56	80	8 40	9·22	10·34		7·8	22·72	24·	25·	65	11·14	11·58
Witness	22·	21·5	6·6	19·76	81	9 16	9·12	10·64		6·8	20·05	24·	25·	65	9·50	10·55
16. Aucarot	20·5	20	11·	18·56	81	7 56	8·84	9·72								
Witness	25·75	25·	7·5	21·84	81	10 32	10·	11·84								
17. Sultana																
Witness	30·5	29·5	5·	28·98	81	12 38	13·72	15·26								
18. Raisin des Dames	17·5	17·	5·9	17·24	81	6 30	8·52	8·72								
Witness	16·5	16·5	7·5	14·12	81	5 38	6·84	7·28								
19. Tokay	18·	18·	4·7	15·44	81	6 44	7·24	8·20								
Witness	21·5	21	4·8	19·28	81	8 24	9·13	10·15								
20. White Sherry	19·25	19	4·2	17·90	79	7 38	8·52	9·38								
Witness	17·5	17·	4·5	16·14	81	7 18	7·56	8·58								
21. Almeria	20·	19·	5·2	18·48	81	6 42	9·18	9·30								
Witness	24·5	23·5	5·4	21·24	81	8 22	10·40	10·84								

Grafted on Mourvèdre x Rupestris, No. 1,202.

	1906. Guyot's Saccharometer.	1906. Keen's Saccharometer.	1906. Acidity per thousand.	1906. Sugar by Fehling's liquor, per cent.	1906. Temperature. (Fahr.)	1906. Polarimetric rotation.	1906. Glucose.	1906. Levulose.	1907. Crop per acre.	1907. Acidity per thousand.	1907. Sugar by Fehling's liquor, per cent.	1907. Guyot's Saccharometer.	1907. Keen's Saccharometer.	1907. Temperature (Fahr.)	1907. Glucose.	1907. Levulose.
									lb.							
1. Black Hamburg ..	18·5	18·5	5·6	17·20	75	7·12	8·35	8·85								
Witness ..	22·	21·5	5·2	20·66	68	8·50	10·10	10·56								
2. Cabernet ..	22·	21·5	7·5	19·76	75	7·54	9·72	10·04	4,725	6·7	25·25	27·	28·	59	12·74	12·50
Witness	26·	25·	6·7	22·26	68	9·54	10·80	11·46	3,691	6·8	25·25	27·	28·	59	12·36	12·89
3. Black Prince	17·5	17·5	6·1	16·92	75	6·58	8·25	8·67								
Witness	20·5	20·	8·3	17·82	68	8·16	8·53	9·29								
4. Malbeck	21·	20·5	6·3	19·60	75	8·56	9·26	10·34	4,833	4·9	23·44	23	24·	59	11·70	11·74
Witness	25·75	25·	5·4	22·88	68	9·50	11·18	11·70	5,638	6	23·14	23·	24·	59	11·70	11·44
5. Royal Ascot	22·	21·5	6·5	20·06	75	7·56	9·90	10·16								
Witness	21·5	21·	8·9	18·92	68	8·46	9·03	9·89								
6. Muscat Hamburg	23·	22·	5·6	21·66	77	8·42	10·60	11·06								
Witness ..	29	28·	5·5	25·46	68	11·24	12·32	13·14								
7. Muscat Fontignac	25·	24·	7·8	23·70	77	8·50	11·84	11·86		7	27·32	27·5	29·	59	13·72	13·56
Witness	27·5	27	6·9	26·38	72	13·24	12·12	14·26	4,698	6·9	31·64	31·	32·	59	15·92	15·72
8. Doradillo	19·	19	4·8	18·44	77	7·32	8·98	9·46								
Witness	21·75	21·	3·5	19·76	72	8·50	9·50	10·26								
9. Syrah	28·	27·	5·9	23·00	77	8·28	11·58	11·50	5,584	7·4	24·63	27·5	29·	63	12·40	12·23
Witness	34·	32·	6·0	27·44	72	9·48	14·01	13·40	5,370	7·4	25·64	27·5	29·	63	13·24	12·40
10. Gordo Blanco	20·5	20·	5·6	18·60	77	8·14	8·84	9·76								
Witness	21·25	21·	5·5	19·40	72	9·10	9·12	10·28								
11. Verdelho	24·75	24·	7·4	22·56	77	9·46	10·80	11·76	4,296	10·	20·95	21·	22·	63	10·56	10·39
Witness	30·	28	6·8	26·00	72	11·10	12·62	13·38		7·5	25·25	27·	28·	63	12·12	12·13
12. Pedro Ximenes ..	25·5	25·	8·3	19·56	77	8·34	9·32	10·24	6,533	7·5	22·32	24·	25·	63	10·10	12·22
Witness	22·	22·	9·1	20·00	72	9·50	9·27	10·73	6,041	7·5	25·16	24·	25·	63	12·14	13·02
13. Pinot Blanc	28·75	28·	7·6	22·88	77	9·12	11·20	11·68		7·5	22·72	25·	26·	65	11·02	11·70
Witness	30·5	30·	7·3	28·22	72	13·58	13·12	15·10		6·6	22·90	24·	25·	65	11·26	11·64
14. Shepherd's Riesling .	23·	22·	6·7	20·58	77	8·10	10·11	10·47	5,191	6·6	23·26	26·	27·	66	11·22	12·04
Witness	29·	28·	7·8	25·20	75	12·20	11·60	13·60	5,584	7·2	30·12	28·	30·	66	14·84	15·28
15. Riesling	26·5	26·	5·7	24·80	75	9·10	12·46	12·34								
Witness																
16. Aucarot	22·	22·	7·9	19·68	75	8·34	9·44	10·24								
Witness																
17. Sultana																
Witness	26	25	4·7	23·54	66	11·50	11·	12·54								
18. Raisin des Dames																
Witness	20·	19·5	5·9	17·82	66	7·28	8·84	8·98								
19. Tokay	25·5	25·	5·2	22·46	75	9·56	10·71	11·75		7·9	26·60	28·	30·	66	13·40	13·20
Witness	20·5	20	4·8	18·12	66	9·28	8·34	9·78	7,249	4·8	23·58	23·	25·	66	11·44	12·14
20. White Sherry	22·	21·	4·2	20·86	75	9·36	9·82	11·04								
Witness																
21. Almeria	22·	21·5	4·9	18·00	65	8·21	8·80	9·20								
Witness	21·	21·	4·9	19·86	68	8·28	9·77	10·09								

American Bronze Turkeys—Breeding and Raising.

A. L. WYNDHAM,
Wagga Experiment Farm.

THE breeding of American Bronze Turkeys is within the reach of anyone who can allow them a free range of not less than 2 acres.

The flock may be commenced by purchase of a sitting of eggs, when a turkey hen is available to mother the brood, or by buying an unrelated gobbler and hens. A thoroughbred male will improve the progeny of common turkeys at any time, but it is impossible to arrive at pure bred stock by this means, as the influence of the common turkey must predominate.

One gobbler is sufficient to mate with ten hens on the average. Special care should be exercised in his selection. Choose a bird rather under standard weight (35 lb.) than over, in general outline pleasing to the eye, thick and medium short in shank, clean in mouth, and about 18 months of age, though they are fit for service from about 10 months.

The hens are best for breeding from 2 years of age and upwards, being more sedate and matured. They lay, on the average, two settings a year, with odd eggs at times, and one service of the male is sufficient to fertilise a setting.

As it is generally necessary for safety to shut them in a yard at night, build the yard round some trees where they may roost—though the heavier birds should be discouraged from roosting, or the place where they fly down made soft, on account of the damage caused to their feet by corns, &c. Clean water, grit, and shell, with granulated charcoal, should always be provided, and green stuff when none is available outside their yard. A feed of grain in the evening, to attract them home, is generally sufficient, but during moulting time and winter give some soft food in the morning.

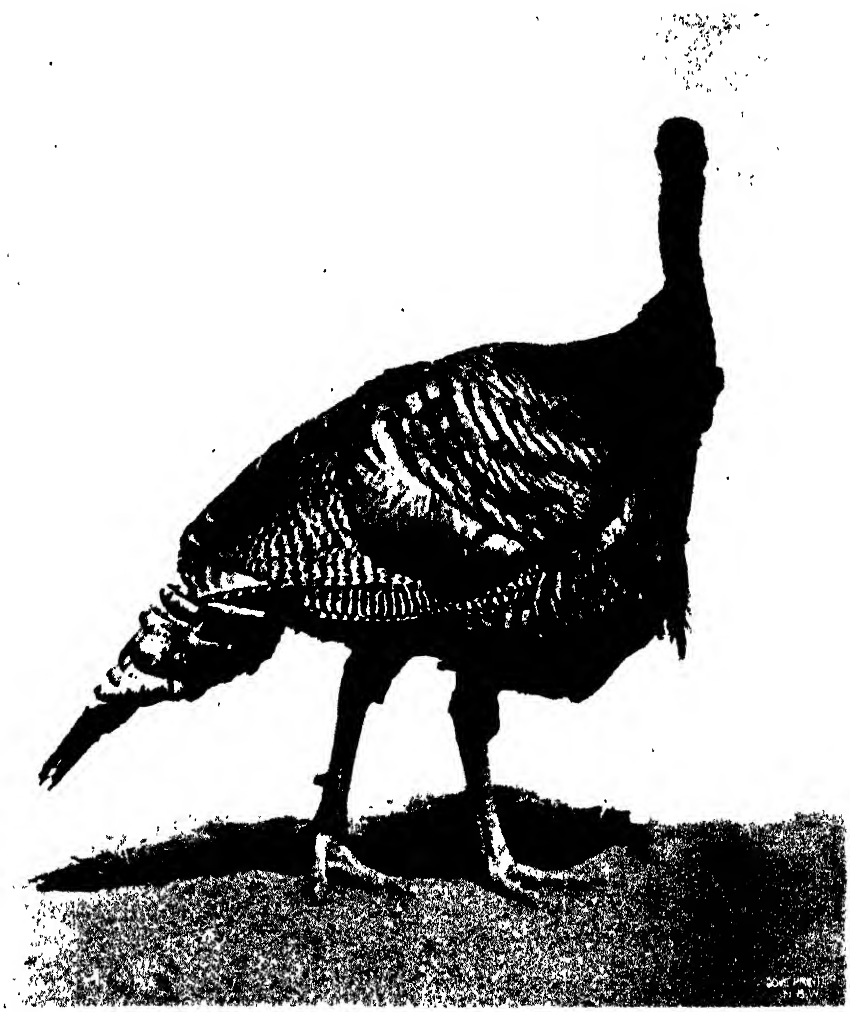
Clean up the droppings often, and feed in troughs where possible.

The chief laying season seems to be from July to September. The hen utters a peculiar cry when off to lay, and should be watched at a distance. It is well to leave a nest egg—a fowl's egg will do.

There is no difficulty in distinguishing a clucky turkey; their legs go red, and the redness on neck and head goes away; the breast also becomes bare. If they can be set on their own nest well and good but should a change to another nest be necessary, handle very quietly and firmly, and give the hen a few eggs, other than those you intend to set, for the first few days. The change may be made from the old nest during the day time if the bird is quiet, and there is no need of a dose of wine or anything to keep her clucky, but have the new nest of such height that the hen cannot stand upright. Keep a board screen before the nest all the hatch. Release for a run every

other day after the third. Very little food is required: a run, a drink, and possibly a dust bath, is all the hen needs.

The recognised time for hatching is five weeks, but is liable to vary slightly. Test for fertility on the seventh day with the ordinary field tester in the sun. When the hatch begins, take every three or four chicks away to some warm place, otherwise the hen becomes restless. Place the mother and brood in an

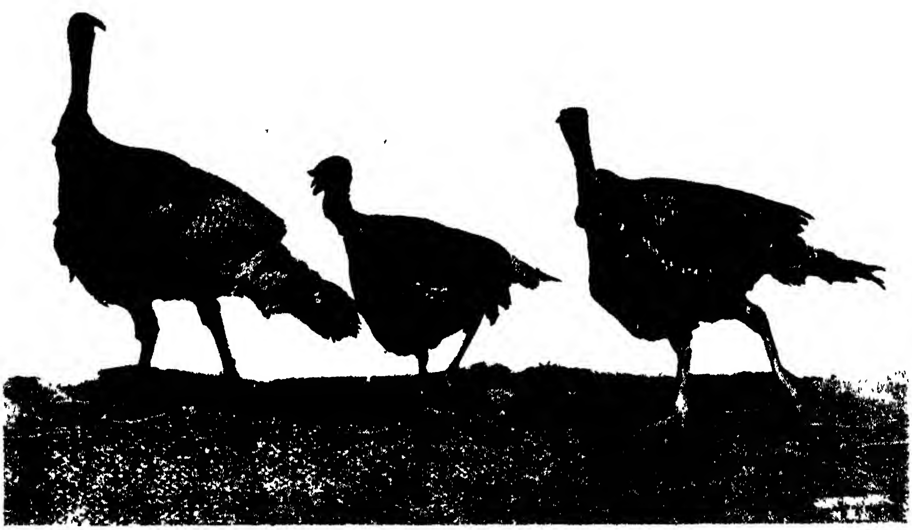


American Bronze Gobbler (imported).

empty shed if available: a coop is too confined. If the hen shows a tendency to leave the brood, shut them in the shed for the first day or so till they learn to follow, being apt to follow anything at first. They do not take harm camping outside from the start, but beware of holes in the corner of yard which are likely to get flooded.

The ground of the yard is best bare, and have small-mesh wire or boards round to prevent the chicks leaving without the hen. Let them roam outside all day when about a week old, even in showery weather if the hen takes them out. If caught in a storm, leave them with the mother till it clears up. The hens are very faithful, and will stay with the poults long after they are wanted. The more hens and chicks together the better for safety. They generally travel against the wind when out, circling back home.

Feed not more than three times a day; the yolk of hard-boiled turkey egg, finely mashed and mixed with meal, for a day or two, and then pollard and bran or chicken mixture. Mix pollard and bran with milk, whey, or buttermilk any time, but avoid meat or soup for the first week or so. Provide



American Bronze Gobblers and Hen (Gobblers Imported).

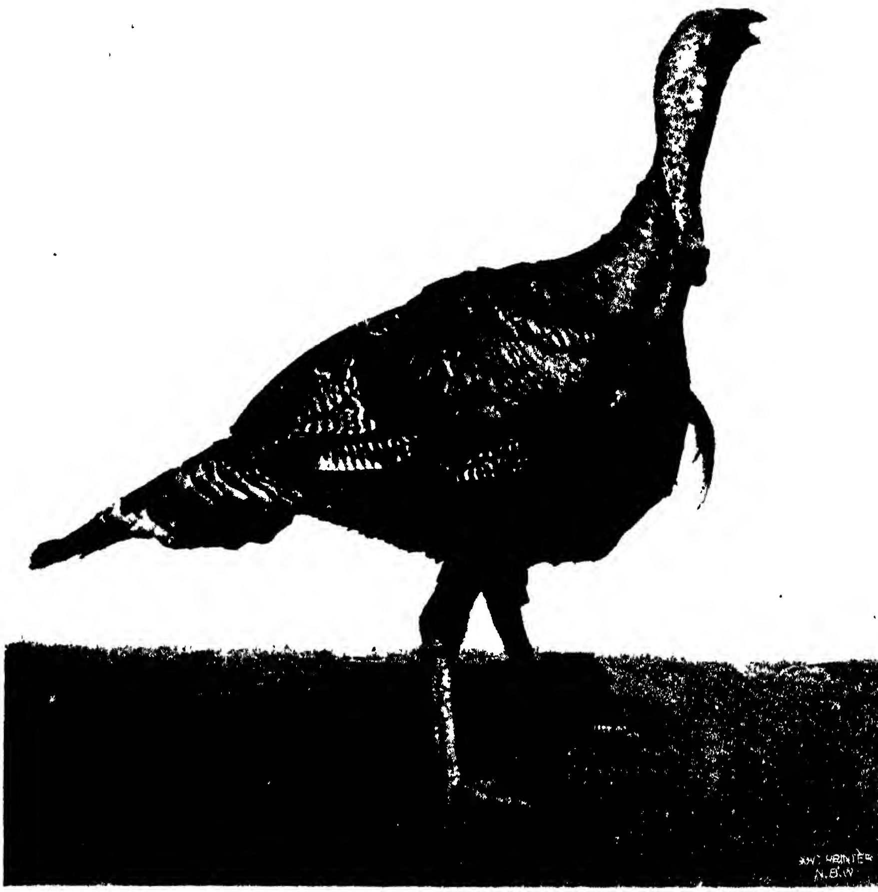
plenty of green stuff when there is none to be had out where they roam. Have oyster-shell grit and small pieces of charcoal for them in the yard.

Keep their drinking water in shallow tins at first, or they will drown themselves; and give enough Condy's Fluid to slightly colour the drinking water, with a teaspoonful of Epsom salts to a gallon of water, about once in ten days.

There is often no need to overhaul chicks for lice if they have an opportunity to take a dust bath. Where they are seen with wings hanging down they should at once be caught, and Mortein or some insect powder sprinkled over them, if lice are to be seen; but in the case of sickness very little can be done beyond a small dose of Epsom salts.

The poults should be matured for market at 10 months.

Turkeys are very nervous birds, and stupid at times, but well repay care and attention. It is best for one person to be in continued charge. Try and bear in mind that the turkey is practically half a wild bird, and give them just that mixture of care and leaving to themselves that meets the case.



Bronze Gobbler.

Judging the Competitive Wheat Exhibits.

ROYAL AGRICULTURAL SOCIETY'S SHOW—EASTER, 1908.

F. B. GUTHRIE.

As in previous years, the judging was based on the actual behaviour of the samples when milled in the model mill of the Department of Agriculture. In addition, an exhibit was prepared in the Farm Produce Pavilion, in which the competing samples where shown, cards being attached to each bag, showing the results obtained by the actual milling of the wheat, and of the testing of the flour obtained. Samples of the mill-products bran, pollard, and flour were also shown alongside the wheats, so that each competitor, or anyone interested in the subject, could not only see the reasons which influenced the judges in forming their decision, but also the actual results obtained on milling the individual samples.

The classes were four in number:

Class 686 for macaroni wheats.
,, 687 for hard or strong-flour wheats.
Class 688 for medium hard wheats.
,, 689 for soft or weak-flour wheats.

A first prize of £7, and a second of £3, was awarded in each class: and a Champion Prize of £3 3s. for the best bag of wheat exhibited in any class.

The judging was entrusted to Messrs. R. W. Harris, head miller, Gillespie Brothers, Anchor Mills, Sydney, and F. B. Guthrie, Chemist, Department of Agriculture.

The milling of the samples was carried out by Mr. G. W. Norris, on the small model mill in the laboratory of the Department of Agriculture.

The following is a copy of the judges' report:

Chemical Laboratory, Department of Agriculture,
Sydney, 15th April, 1908.

The Secretary, Royal Agricultural Society,—

Dear Sir,

We have the honor to forward nerewith the results of the judging of the wheat samples competing for the Commonwealth prizes.

The method adopted in judging these wheats was the following:—The wheats being placed in their respective classes were in the first place subjected to careful scrutiny with the object of eliminating those that were outclassed or of inferior quality. The bushel-weight of each sample was taken at the same time, and these weights are given in the table attached. The result of this preliminary examination was as follows:—

In Class 686.—Nos. 3860, 3859, and 3861 were rejected.
Nos. 3863, 3862, and 3864 were milled.

In Class 687.—Nos. 3875, 3873, 3865, 3867, and 3870 were outclassed.
Nos. 3871, 3872, 3868, and 3869 were rejected as inferior.
Nos. 3866, 3874, and 3876 were milled.

In Class 688.—Nos. 3891, 3878, 3879, 3880, 3887, and 3884 were outclassed.
Nos. 3881, 3890, 3889, and 3883, rejected as inferior.
Nos. 3885, 3886, 3882, and 3888 were milled.

In Class 689.—Nos. 3902 and 3898 were outclassed.
Nos. 3900, 3899, and 3896, rejected as inferior.
Nos. 3892, 3893, 3897, 3895, 3901, and 3894 were milled.

The wheats thus set aside were milled and marks assigned, as shown in the attached tabulated statement, in accordance with their appearance, weight, and behaviour the mill.

The figures in brackets show the actual results obtained on milling, the other figures being the marks assigned.

It must be understood that the marks are assigned only as between wheats in the same class.

The milling of the samples was in all cases done by Mr G. W. Norris, in the Department's model mill, and our best thanks are due to him.

The judging of the wheat samples has been more than usually difficult this year on account of the even and excellent quality of the exhibits.

The exhibits show a considerable improvement in all classes over previous years, and a glance at the table of bushel-weights show that some of them are remarkably heavy.

There was, as always, some difficulty with wheats entered in their wrong class. Some of these were very fine samples of grain and would certainly have received a prize had they been entered in their proper class. It is particularly in the hard and medium-hard classes that wrong entries have been made.

In awarding the championship prize for the best bag of wheat exhibited, these out classed wheats have been taken into account.

WEIGHTS PER BUSHEL.

Class 686 (Macaroni).

Catalogue No.	Weight per Bushel. lb.	Catalogue No	Weight per Bushel lb
3859	61¾	3862	64
3860	63½	3863	63½
3861	65¾	3864	62

Class 687 (Hard Wheats).

3865	64½	3871	62½
3866	64	3872	62¼
3867	66	3873	65½
3868	63¾	3874	63½
3869	64¾	3875	67
3870	65¼	3876	64

Class 688 (Medium Hard).

3878	66¼	3885	66
3879	65¼	3886	66
3880	64½	3887	67
3881	65½	3888	64¾
3882	66	3889	65¾
3883	63¾	3890	65½
3884	65	3891	63

Class 689 (Soft Wheats).

3892	65¾	3898	64¾
3893	65½	3899	65
3894	65½	3900	61¼
3895	64¾	3901	65¾
3896	64¼	3902	66¼
3897	65¾		

Results of Milling Tests.

Catalogue No.	Appearance of Grain.	Weight per Bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of Gluten.	Strength.	Total.
Maximum Marks.	15	15	10	10	10	20	20	100
Class 686 (Macaroni).								
3862	15	*[64]* 15	*[diff.]* 10	*[69 8]* 10	8	*[16·91]* 20	*[46]* 18	96
3863	13	*[63½]* 15	*[diff.]* 10	*[69·4]* 10	10	*[14 79]* 17	*[45 9]* 18	93
3864	12	*[62]* 14	*[diff.]* 10	*[67·2]* 8	9	*[14·77]* 17	*[49 4]* 20	90
Class 687 (Hard or Strong Flour).								
3866	15	*[64]* 15	*[fair]* 10	*[71·3]* 10	10	*[14·55]* 20	*[53·6]* 19	99
3874	14	*[63½]* 14	*[fair]* 10	*[69 6]* 9	9	*[11·57]* 19	*[55·2]* 20	95
3876	13	*[64]* 15	*[fair]* 10	*[71·0]* 10	9	*[10·31]* 18	*[49·2]* 17	92
Class 688 (Medium Hard).								
3886	15	*[66]* 15	*[fair]* 10	*[72 9]* 10	10	*[11·76]* 18	*[56·4]* 19	97
3882	14	*[66]* 15	*[fair]* 10	*[70·7]* 8	9	*[15·27]* 20	*[58·2]* 20	96
3888	13	*[64½]* 14	*[fair]* 10	*[71 7]* 8	8	*[11·78]* 18	*[54·8]* 18	89
3885	13	*[66]* 15	*[fair]* 10	*[70·9]* 8	7	*[10 11]* 16	*[56 4]* 19	89
Class 689 (Soft or Weak Flour).								
3897	14	*[65¾]* 15	*[easy]* 10	*[70 8]* 10	10	*[11·02]* 19	*[49·6]* 18	96
3895	13	*[64¼]* 13	*[easy]* 10	*[70 3]* 10	8	*[13 85]* 20	*[50 4]* 20	94
3901	15	*[65¾]* 15	*[easy]* 10	*[70 5]* 10	7	*[9 67]* 18	*[48·0]* 16	91
3892	12	*[65¾]* 15	*[easy]* 10	*[70 4]* 10	7	*[9·81]* 18	*[49 0]* 17	89
3894	12	*[65½]* 14	*[easy]* 10	*[70 8]* 10	7	*[8·64]* 16	*[49 4]* 18	87
3893	12	*[65½]* 14	*[easy]* 10	*[70·3]* 10	7	*[7 96]* 14	*[50·0]* 19	85

Awards.

Class 686.—Macaroni.
- First prize, No. 3862, W. G. Reinhard.
- Second prize, No. 3863, A. Thibault.

Class 687.—Hard Wheats.
- First prize, No. 3866, W. Fulljames.
- Second prize, No. 3874, W. G. Reinhard.

Class 688.—Medium Hard.
- First prize, No. 3886, Russell Brothers.
- Second prize, No. 3882, Hon. G. H. Greene, Iandra Estate.

Class 689.—Soft Wheats.
- First prize, No. 3897, George Lindon.
- Second prize, No. 3895, Hon. G. H. Greene, Iandra Estate.

Champion Prize, for best bag of wheat exhibited, No. 3886, Russell Brothers.

R. W. HARRIS,
F. B. GUTHRIE.

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The following information regarding the prize-winning wheats was obtained from the entry forms through the courtesy of the Secretary of the Royal Agricultural Society :—

Class 686.—Macaroni.

First prize, No. 3862, W. G. Reinhard ; variety not stated ; grown at Oddfield, near Wellington, on chocolate soil ; sown at rate of 1 bushel per acre ; yield 16 bushels.

Second prize, No. 3863, A. Thibault ; variety not stated ; grown on white gritty soil, on Peel River Co.'s Estate, near Tamworth ; sown at rate of $\frac{3}{4}$ bushel per acre ; yield 16 bushels.

Class 687.—Hard Wheats.

First prize, No. 3866, W. Fulljames ; variety Manitoba ; grown on Peel River Estate, near Tamworth, on strong black land ; sown at rate of 1 bushel per acre ; yield 10 bushels.

Second prize, No. 3874, W. G. Reinhard ; variety Manitoba ; grown at Oddfield, near Wellington, on chocolate soil ; sown at rate of 1 bushel per acre ; yield 12 bushels.

Class 688.—Medium Hard.

First prize, and Champion prize for best bag of wheat exhibited, No. 3886, Russell Brothers ; variety Bobs ; grown at Woodbine, near Grenfell, on undulating country ; sown at rate of $\frac{3}{4}$ bushel per acre ; yield 20 bushels.

Second prize, No. 3882, Hon. G. H. Greene, Iandra Estate, near Grenfell ; variety Comeback ; grown on dark chocolate soil on Iandra Estate ; sown $\frac{1}{2}$ bushel, yield 20 bushels per acre. Rainfall $14\frac{1}{2}$ inches during growing season.

Class 689.—Soft Wheat.

First prize, No. 3897, George Lindon ; variety Jade ; grown at Gobbagumbalin, near Wagga, on chocolate loam ; sown at rate of 40 lb. per acre ; yield 12 bushels.

Second prize, No. 3895, Hon. G. H. Greene, Iandra Estate, near Grenfell (variety not stated) ; grown at Iandra Estate, on granite ridge ; sown at rate of $\frac{1}{2}$ bushel per acre ; yield 36 bushels. Rainfall $14\frac{1}{2}$ inches during growing season ; $19\frac{1}{2}$ inches during the year.

The Weeds of New South Wales.

RIB-GRASS OR PLANTAIN (*Plantago lanceolata*, L.)

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

FOR a description of the genus *Plantago* and of the Family Plantaginaceæ, see the *Flora Australiensis*, vol. v, page 137.

Vernacular Names. "Rib-grass," or "Ribwort," because of the stout nerves or ribs of the leaves; "Plantain"; "Ripple Grass" (of the United States); "Buck or Buckthorn Plantain" (United States); "Narrow Plantain" (in comparison with the "Broad Plantain," *Plantago major*). Occasionally, with other species, called "Lamb's Tongue."

Botanical Description.—A herb with radical tufted leaves and a tapering rootstock; more or less woolly or silky-hairy at the top.

Leaves.—Lanceolate, very variable, from under 3 to above 12 inches long, generally with 5 strong very prominent parallel nerves; rarely with more or fewer nerves.

Flower-stalk.—Leafless, about as long as the leaves.

Flowers.—Small, crowded at the top of the stalk into an ovoid or cylindrical spike, ½ to 3 inches long, usually short in flower, but lengthening out in fruit.

Sepals.—4, hairy at the tip, 2 united nearly to the top.

Corolla.—With a tube exceeding the calyx and 4 broad, concave spreading or reflexed lobes.

Stamens.—4, the long, thin filaments much exserted from the corolla-tube, bearing large mobile anthers.

Style.—Long and filiform, with 2 stigmatic lines in the upper part.

Ovarium.—2-celled.

Capsule.—Opening transversely (circumsciss) below the middle, with 2 large, black shining seeds with a mucilaginous testa.

Very common in Europe and temperate Asia, and now established in New South Wales everywhere in cultivated land.

In his interesting paper "Notes on the Fertilisation of some Australian and other Plants" (*Proc. Linn. Soc. N.S.W.*, XXIII, 763 [1898]), Mr. A. G. Hamilton discusses the evolution of the entomophilous form (*i.e.*, in which the pollen is carried by insects) from the anemophilous condition (*i.e.*, in which the pollen is carried by the wind).

Bad points of this weed.—In the United States it is reputed to be one of the worst weeds, particularly on light, sandy soils. It is aggressive and smothering. It often comes with dirty grass or clover seed. Where there is but little of it, it can be eradicated with a narrow hoe. Where it is plentiful, the breaking up and cultivation of the land is the only method of dealing with it

If it is plentiful in lawns, it is best to cut the affected portions out and returf.

Never allow it to seed. The seed is the food of many birds, and is abundantly disseminated through their agency.

An official American report calls it a "vile pest." It is spreading in New South Wales, and should be kept under control.

Uses.—"Some farmers have recommended this plant, by the name of rib-grass, as a good food for sheep, or to be made into hay for cattle in general. It yields indeed an abundant crop, but it has been said no domestic animal will eat it, except mixed with other vegetables; which, if true, is not much in its favour."—(*English Botany*, Vol. 3, J. Sowerby.)

There is no doubt, however, that they eat it when it is young. To this day it is frequently recommended in Europe as a constituent of pasture mixtures. It possesses the advantage of growing on the most sterile soils.

I certainly do not recommend its cultivation in New South Wales, believing that we have many plants superior in merit to it and possessing fewer of its disadvantages.

EXPLANATION OF PLATE.

A. Flowering specimen; ovate-shaped flower, cylindrical in fruit.

B. The whole flower supported by a bract (*a*).

(*bb*) 4 sepals.

(*c*) Two of the sepals which are connate.

(*d*) Corolla with 4 recurved lobes.

(*e*) 4 stamens.

(*f*) 1 long style.

C. The capsule opened circumsciss and showing the two seeds (*b*); the corolla with its reflexed lobes (*a*) adheres to the capsule.

NOTE.—The leaves are 5-ribbed, one rib in the middle and two on each side, though in broad leaves there may be two more faint ribs, one on each side. The 5 ribs are so constant that the species has been named "quinquenervia" on that account, though the name is abandoned.

The inflorescence is ovoid when in flower, rarely more elongated, but it lengthens out to cylindrical when in fruit.


A
B
C
D
a
b
c
d
e
f

Wheat-growing

At Wagga Wagga Experiment Farm.

G. M. McKEOWN.

Preparation.

Experience in a variety of seasons has furnished ample proof that it will pay wheat-growers to thoroughly prepare the land for sowing, and it is recommended that all soils of fair depth should be ploughed to a depth of 6 inches where practicable. This cannot be accomplished under all conditions experienced here, as much of the Riverina soil sets very hard in dry weather, and is then difficult to work.

The use of rotary disc ploughs has largely improved these conditions, as with them it is possible to start ploughing much earlier after the removal of a crop, or when weather conditions are unfavourable. In all seasons we have been able to commence work in January, and in a large proportion of our land it has been possible to perform excellent work in deeply ploughing and pulverising the soil. In addition to their being excellent dry-weather implements, their work is very economical, as we have ploughed up to 5 acres in eight hours with one plough drawn by five horses. The cost of discs is moderate, an expenditure of £3 10s. per year covering the wear and tear under this heading for, say, 500 acres. The cost of repairs is light, one of our ploughs having recently required some new parts for the first time after nearly six years' use. For fallowing, however, the use of mould-board ploughs is essential, as in the spring season weeds which are then plentiful are better covered by them than is possible with disc ploughs.

The pulverisation of the soil to as great a depth as possible is of very great importance; therefore, the value of these implements cannot be overrated. The system of shallow ploughing is to be condemned; and if farmers would prepare areas side by side, respectively ploughed deep and shallow, they would soon become convinced that the extra cost incurred of breaking their land 6 inches instead of 3 inches deep would be more than repaid to them in the increased crops.

It is sometimes urged that, as wheat is a surface-feeding plant, shallow ploughing is all that is necessary. A forest tree may exist in the soil contained in a 6-inch pot, but it cannot attain its full development; and wheat compelled to find nourishment in the upper 3 inches of the soil naturally cannot find as much food and moisture in that space as in 6 or 7 inches of free soil. Besides this, it is often found that when the first 6 inches of the soil is broken, that next below is sufficiently free to readily admit the roots of the plants in search of nourishment at a greater depth.

The method of preparing land by merely scarifying the surface of stubble paddocks is strongly condemned, as it can only have a chance of success in unusually favourable seasons, which, unfortunately, are of rare occurrence.

Rolling and Harrowing.

In soil which is liable to crust on the surface, it is desirable, where rolling is necessary, to carry out the work before the seed is sown, and not to roll afterwards till the crop is fairly well grown, and then to follow with light harrows drawn across the drill furrows. Soils vary so greatly that it is not desirable to lay down any hard and fast rule on work of this kind, as much can be learnt by observation on the part of cultivators, many of whom have a variety of soils under their care in which uniform treatment would be undesirable. Under our conditions we have usually found it best to leave the land with the slight furrows formed by the drills, as an even surface is very liable to crust and cause the rainfall to run off.

Disc Plough at Work, Wagga Experiment Farm.

The harrowing of growing crops may be carried out until the crops are about 6 inches high, provided the soil is firm enough to keep the harrows from penetrating deeply, but it should not be done before the plants are well rooted. The best time for the operation is after the land has been made fairly firm by rain, as then there is less risk of damaging the crop by too deeply operating with the tines of the harrow. Damage to roots is thus decreased, and the chance of injuring plants by means of the bars of the harrow is also lessened. Light harrows only should be used, and they should be drawn at right-angles to the drill furrows. Care should also be taken to avoid harrowing after any of the straw joints have formed in the plants.

Seed Selection.

The importance of seed selection is again impressed upon those who are about to sow; therefore, where individual farmers cannot afford a grader of

the best kind, it is suggested that such implements be obtained and worked by groups of grain-growers for their mutual benefit.

Good implements, however, are obtainable at moderate prices; and as considerably increased yields may be obtained by using only the best grade of seed, the cost of a machine would soon be recouped.

Some years ago tests of varying grades of seed, graded and sown by hand, were carried out on a small scale on this farm, and the results were always in favour of the best qualities.

Trials of varying qualities of seed carried out on a fairly large scale with machine-graded seed resulted in a gain for first-grade seed of $2\frac{1}{2}$ bushels per acre above that harvested from second and third grades sown together.

Method of Sowing.

The advantage of drilling over broadcasting seed has been frequently advocated and demonstrated. The increased yield, together with the saving in cost of seed, will more than cover the cost of a drill on the first 150 acres. Trials of varying quantities of seed have been made, and results amply demonstrate the desirability of sowing only moderate quantities of seed, as although sowings of 60 lb. per acre show a larger total return, the average gain from the extra seed is only nominal.

For general field work we set out drills to sow half a bushel; and as grain varies in size according to variety, our average sowing will work out at about 33 lb. to the acre. Half a bushel per acre under our conditions we regard as the minimum quantity to be sown, with a maximum of 40 lb. per acre for seasonable sowing.

Should sowing be delayed, as is sometimes unavoidable, the seeding should be increased to 50 lb. per acre to compensate for the decreased stooling or tillering power of the plants, which diminishes as the season advances.

Drill-drivers, when sowing, should see that their machines have the inner wheel so far overlapping the land sown in the previous round as that the space between the rounds shall not exceed that between the tines of the drill.

It is frequently noticed in district crops that the space of a tine is left unsown in every round through failure to drive with the necessary overlap. As these blanks are equal to 8 per cent. of the area prepared for sowing, it will be realised that the omission is an expensive one.

Fertilisers.

Tests carried out during the past eight years have shown that very profitable results may be obtained from the use of moderate quantities of superphosphate drilled in with the seed.

In districts with a light to fair rainfall a maximum sowing of 60 lb. per acre is recommended, as, if this quantity be exceeded, there is a risk of crops suffering should adverse conditions set in, as a larger bulk of manure may remain partly undissolved round the roots of the plants. In new land the

quantity may be reduced to 40 lb. for the first sowing. In course of time it will probably be found necessary to increase the quantity, and to supply a fertiliser more closely approaching a complete manure.

The practice of manuring wheat on the lines shown by our tests to be the most successful is now being extensively followed, and no farmer who has once tested the value of the system will abandon it for the old method, under which wheat-growing was far less certain of success.

Our paddocks are rested occasionally by a sowing of rape, which provides pasture for sheep, besides which the rape is of value in opening up the subsoil for succeeding crops. This practice is also valuable in helping to free the land of weeds, which are also eaten off by the sheep. A partial rest is also afforded by the cultivation of hay crops, which are cut while green, and before the grain reaches a forward stage of development

One paddock is being alternately used for the production of crops and pasture, and the trials so far are showing excellent results in improving both branches of farming.

With the use of fertilisers it has been shown that the yields of grain may be increased by 35 to 40 per cent. at a very moderate cost. It is necessary, however, that the manure should be sown with the drill, as the young plants receive benefit from it from the beginning of life. The root system is rendered more vigorous, and the plants are induced to feed at a greater depth, thus utilising a greater area of soil for their sustenance than is the case where the manure is sown on the surface or the crop is not fertilised. The supply of moisture, also, is better at the greater depth.

Top-dressing is unsatisfactory, as the roots are attracted to the surface, and the crop suffers when their growth approaches maturity, or when adverse conditions set in.

At Wagga, manured crops usually ripen about a fortnight earlier than those untreated, and most probably this feature will be found to have a very important bearing on the rust problem.

Treatment for Smut.

As a preventive of smut and bunt, we treat the seed with a 2 per cent. (1 lb. to 5 gallons) solution of sulphate of copper, immersing the seed for not more than four minutes. Should the seed, however, not be well filled, the dipping should accordingly be of less duration, it being desirable not to exceed two minutes. Some varieties are more liable to the attacks of bunt than others, and in such cases it has been found necessary to increase the quantity of bluestone to 3 per cent. (1 lb to $3\frac{1}{3}$ gallons). Ten gallons of solution should treat about 10 bushels of seed.

Our practice is to spread the seed on a floor to dry, after dipping, and to sow it as soon as it is dry enough to pass through the seed drills, about twelve hours usually being sufficient for the drying process.

No more than sufficient for one day's sowing should be treated at once, as it has been clearly proved that delay in sowing treated seed is responsible for considerable loss of seed.

Care should be taken to purchase only the best quality of sulphate of copper, avoiding crushed or discoloured samples. The crushed bluestone renders its adulteration easy, and the discoloured article usually lacks strength

Care should also be taken that the sacks in which the grain is placed after drying are perfectly clean, it being preferable to use new sacks, or those which have been dipped in the solution.

Sowing Time.

The best time for sowing is from the middle of April to the end of May; but, when circumstances require it, a week in June may not be too late. A good deal of sowing is carried out in Riverina before April; but in our portion of the district crops sown so early, no matter what the variety of wheat, have a tendency to produce too much straw in good seasons.

Should insufficient rain fall in March or April, there is considerable risk of loss of seed, or at the least of a severe check to earlier sown crops which may have obtained a start.

These risks, however, are greatly decreased by fallowing the land from winter or spring in the preceding year, as land so prepared is in a better condition to receive and retain such moisture as may fall between the ploughing and sowing seasons As it is seldom that late sown seed returns anything like the crops harvested from seasonably sown areas, it will pay better to fallow such land as cannot be sown by the first week in June.

It has been further noted that a curtailment of the areas sown should place many growers in a position to carry out their harvesting more seasonably, thus benefiting themselves individually, in addition to increasing our district average, as crops are considerably decreased by insufficient preparation of the soil which is due to a desire to sow large areas.

If the labour expended on such areas were concentrated on half or two-thirds of the land, seasonable sowing and harvesting would be possible, and the profit on capital and expenditure would be much greater than is the case at present.

Wheat for Hay.

The raising of wheaten hay for home consumption in ordinary seasons, for fodder reserves against drought seasons, or for sale in the city markets, is worthy of greater attention than is usually given to it. Under our conditions a crop of wheaten hay may be counted on with much more certainty than is the case with oats, which requires much more moisture to bring it to perfection. It is, however, possible to secure payable crops of oaten hay when good varieties are sown early in the autumn.

The average hay yield at the Wagga Farm for eight years, including two drought years, is slightly over 2 tons per acre, which, in ordinary seasons, can be sold at a profit of £1 10s. per ton.

At present, sales could be made at a profit of nearly £5 per ton.

The profitable nature of hay-growing, if properly carried out, will therefore be apparent, but, so far, it is comparatively neglected by farmers.

One of the recent developments of the industry is its adoption by pastoralists, on a large scale, for feeding their own stock. In fact, we have for some time been unable to meet the demand for seed of varieties which we recommend.

The method of preparing the land is the same as that applied to land used for the production of grain.

The most successful fertiliser has been Shirley's No. 3, containing 13 per cent. water-soluble phosphoric acid, 3·3 per cent. nitrogen, and 3·77 sulphate of potash, the quantity used being 70 lb., costing 4s. 6d. per acre. In all cases the seed and manure have been sown with the drill, the quantity of seed used being 45 lb. per acre, first quality grain. March and April will be found the best months for sowing.

White straw wheats are far preferable to the purple straw varieties for haymaking, as the weight is much greater, the straw has far less "dead flag," and the hay is better liked by stock of all kinds. In selecting varieties, care should be taken to choose those which carry a green colour to the lowest possible point on the straw. The varieties which have proved the best with us are Zealand or Berthoud, White Essex, Australian Talavera, and White Lammas, in the order named. The best stage of growth for cutting wheat for hay, to secure weight, colour, and quality, is just when it is flowering. If properly saved at this stage and cut into chaff not less than half an inch, it will command the best prices in the Sydney market, as the best quality Riverina chaff is much sought after.

Varieties.

Among the best croppers in this district are some of the varieties which have recently been rejected by the Department on account of their lack of flour strength.

Of the new varieties, those which have stood the longest trials, and have come out best, are Federation and Plover.

Of those which have been grown for a shorter period, Jumbuck has proved the most satisfactory.

Of old varieties, Marshall's No. 3 will be found to meet all requirements, being a good cropper and not liable to rust. Of the grain varieties, it will be found to make hay of good quality.

Gosford-Narara Fruit Fly and Codling Moth Control Experiment.

WM. B. GURNEY,
Assistant Entomologist.

CODLING MOTH, though one of the most widespread orchard pests, may be checked by spraying with an arsenical wash at the right time, and bandaging the trees. The bandages are not put on merely to prevent the grubs crawling past up the trees, but to form an attractive home to collect the grubs about to pupate, and therefore the bandages require to be removed every week, and the grubs and pupæ, to the last one, destroyed each time; otherwise, and as too frequently happens, the bandages not being attended to, the orchardist is merely providing a safe home for the moth, grubs and pupæ, and aiding the increase of moths in his orchard.

Fruit flies as yet have not been found susceptible to spraying or fumigating, and the only known methods are destroying all windfalls and infected fruit found in orchards, shops, and markets, and therefore preventing the maggots from developing; also scalding empty fruit cases which may have held infected fruit, and thus destroying any pupæ within the cases. Useful results have sometimes been gained by oil-traps, consisting of flat tins or china saucers containing a little kerosene or other oil. As many as 200 adults have been captured in a couple of tins within three days.

The life history of the common Mediterranean Fly, with variations according to the season of the year, is briefly as follows:—The eggs are inserted up to a quarter of an inch beneath the skin of the fruit by the ovipositor of the female. From four to fourteen eggs may be found in a single puncture. The eggs hatch within a few days, up to a week or two. The grubs feed for a period from a couple of weeks to about six weeks, and then, fully grown, crawl out of the fruit and pupate just below the surface of the soil. The fruit usually has fallen to the ground by the time the grubs are full-grown; if not, as in the case of Seville oranges, the grubs simply drop to the ground from the hanging fruit.

In from six days to a couple of weeks or more the adult fly hatches from the pupal stage.

I have bred adult flies from pupæ buried in soil to a depth of 6, 8, 10, and over 12 inches. In each case a large percentage of the adult flies worked their way to the surface, and were apparently as lively as those bred from pupæ at the surface; therefore burying fruit is not permissible under the Regulations as being too uncertain and requiring too much labour to bury deep enough, and in separate holes, every three days throughout the year.

Inspection of orchards under the Vine and Vegetation Diseases (Fruit Pests) Act, 1906, commenced in May, 1907. The first Regulations, 6th March, 1907, were superseded by those gazetted on 27th November, 1907, and further amendments, including a penalty clause, are now essential. The following extracts are from the November, 1907, Regulations:—

2. The following methods of treatment of plants affected by any fruit pest shall, until further notice, be deemed to be effective:—

(*a*) For Codling Moth (*Carpocapsa pomonella*)—

i. All apple, pear, and quince trees must be bandaged with a band of suitable material with two folds, from the first day of November in each year until the crop has been harvested. The bandages must be examined at least once in each period of seven days, and all larvæ and pupæ found therein destroyed.

ii. All infected fruit must be collected and destroyed at least once in each period of four days.*

iii. All apple, pear, and quince trees shall be kept clear of dead bark and broken limbs. If, in the opinion of an inspector, any supports or other materials attached to or used in connection with any such trees are likely to convey any fruit pest, the inspector may require the owner or occupier to remove or destroy such supports or other materials.

iv. All fruit-trees remaining in any abandoned, deserted, or neglected orchard, and being, in the opinion of an inspector, likely to convey any fruit pest, shall be uprooted by the owner or occupier and destroyed.

(*b*) For any species of Fruit Fly (Tephritidæ)—

v. All infected fruit and windfalls (except windfall lemons) must be collected and destroyed at least once in each period of three days: Provided that an inspector may by notice in writing require the owner or occupier to destroy windfall lemons.

vi. All Seville oranges remaining in any orchard on and after the first day of August in each year, whether on the trees or otherwise, must be destroyed: Provided that at the request of the owner or occupier an inspector may exempt any crop or portion of a crop from the operation of this Regulation for such period and subject to such conditions as he may think fit.

3. The destruction of fruit must be effected by boiling for fifteen minutes, or by burning, and of plants and packages by burning. Fruit cases or other packages may be treated by immersion in boiling water for two minutes.

It is discouraging to note the shortsightedness of some growers in wilfully neglecting to carry out the Regulations which are framed for no other purpose than to help the fruit industry. The refusal of other States to receive fly-infected fruit has forced the necessity for universal action under an Act upon these growers. And it must be apparent to all concerned that continuous and frequent destruction of fallen and infected fruit by every person, from those growing on the largest scale down to the person with but one tree in the back yard, is a method by which we may expect to control these pests.

Experiment to demonstrate to growers the practical value of carrying out the provisions of the Fruit Pest Regulations.

I have now commenced (May, 1908), with the approval of the Minister for Agriculture, an experiment (to extend over a period of two years) to demonstrate in a single district the advantage, or otherwise, which will result

* Note.—Growers are advised to pick off and destroy any infected fruit remaining on the trees.

from rigid application of the methods advocated by the Entomological Branch for checking fruit flies and codling moth. These methods are embodied in the Regulations above indicated.

The scheme was initiated in a conversation with Mr. Thacker, President, Miranda School of Arts, where I had delivered a lecture on "Fruit Pests."

After inspecting various Cumberland and Northumberland orchard districts, Gosford and Narara was chosen as presenting a somewhat isolated district with codling moth and badly infested with the three species of fruit flies:—*Ceratitis capitata*, the so-called Mediterranean Fly, and the commonest in our orchards; *Dacus* (*Tephritis*) *tryoni*, the Queensland Fly; and *Trypeta psidii*, the Island Fly. The flies have every opportunity for increase there as there is a very great variety of fruits grown; and, moreover, wild fruits abound in the district, growing in some cases a few hundred feet from the orchards.

Dacus tryoni and *Trypeta psidii* have been bred from three species of wild fruits in the district, viz., native plum or black apple (*Sideroxylon australe*), berries of white ash (*Schizoneria ovata*), and wild black fig (*Ficus stephanocarpa*). There is, therefore, opportunity to test if reinfection from wild fruits annuls to any great degree the value of the work done in the orchards to check the fly. It is thought not, as the two species of fly attacking the wild fruits are not nearly so prevalent in the orchards as the Mediterranean Fly; and, further, if reinfection from the bush were frequent, it is thought not to be so serious as reinfection from the infected fruit neglected within the orchard, and, therefore, destruction of infected fruit within the orchards would still reduce the fly considerably.

Below is printed a circular sent to every grower and person concerned (about 120) in the Gosford-Narara district, and which indicates the points to be investigated:—

Entomological Branch, Sydney, New South Wales, May, 1908.

Control of Fruit Flies and Codling Moth in the Gosford and Narara Districts.

COMMENCING from this month the Minister for Agriculture has arranged that the Entomological Branch will carry out practical operations during the next two years to check and control fruit flies and codling moth in the Gosford and Narara districts.

Universal destruction of all infected fruit, on or off the trees, and spraying and bandaging for codling moth are the only methods known to check these pests. So long as any infected fruit is left undestroyed, so long is the fly going to continue and increase, and it is the only way in which this and similar pests can increase. Similarly codling-infected fruit, and the grubs in the bandages must be destroyed, or the moth will not be checked. These principles are now recognised by all intelligent growers, and the people of Gosford and Narara will be glad to learn that the object of the present undertaking is to demonstrate in their district, and record for the information of the growers throughout the State, that fly and moth can be controlled by the above methods.

The inspection and requirements in the orchards and shops will be exactly the same as in other districts under the Regulations of the Fruit Pests Act, 1906. A small insectary will be erected at Narara, at a central spot, and experiments and thorough inspection will be made under the direction of Mr. Gurney, Acting Entomologist. The inspection of the orchards and shops will be undertaken by Mr. Gallard, Fruit Inspector.

Mr. Gurney intends making a record of:—

The amount of infection at different seasons, and in different crops.

The life histories of the various fruit flies; number of broods each year, and sequence of crops attacked.

Infection of wild fruits; extent of reinfection of the orchards, if any, from adjacent wild fruits.

Results of destruction of infected fruit in orchards and shops, and imported into the district by rail, &c.

Experiments with any methods which may suggest themselves as likely to check the pests, such as oil-traps, sprays, use of parasites, &c.

The success of Mr. Gurney's work will depend much on the co-operation of the growers. The owner or occupier of every orchard, and even the person with but one fruit-tree, becomes a benefactor in, or a menace to, his district, according to the thoroughness with which he undertakes the proper attention to infected fruit and windfalls, and appreciates the general effort to be made to cope with these two most serious pests of the orchardist.

As a first step, growers are asked to kindly fill in the attached slip, and hand the same to the Fruit Inspector some time during the next two weeks. This will enable some idea to be formed of the distribution and extent of the various fruits in the area under experiment.

The effects of the general operations, and of any other experiments made at the insectary, or in the district, will be made known when successful, and should result in much useful information for the growers in coping with the pests concerned.

At the same time information will be gladly supplied by the Entomological Branch upon other insect pests, and the sprays and methods necessary to check them.

I have, &c.,

HENRY C. L. ANDERSON,

Acting Under Secretary.

A Valuable Fibre Plant (*Asclepias semilunata*).

CHAS. A. WHITE, F.R.H.S., &c., Uganda Protectorate.
(Late Forest Officer, Coolgardie, W.A.)

WHEN the Coolgardie gold-fields were first known, the writer was an employee in the Melbourne Botanic Gardens, and having been seriously attacked by the gold fever was, with thousands of others who have been more or less successful, soon upon the field. That was at the end of 1893. Some two years after, while camped near Bulla-Bulling at an old deserted camp, the writer was astonished to find some oats in full ear; but what struck him principally was a plant producing white clusters of flowers, and large bladder-like capsules containing a fluffy silky fibre like the Scotch thistle, and producing a white milky substance similar to rubber. This plant must have been brought by seed in imported forage.

When the South African war broke out, the writer this time got the war fever and proceeded to Africa, and remained there, having travelled from the Cape to the Zambesi, Portuguese Africa, and then to the Equator and Congo. In all these countries this particular plant was seen in isolated parts, but not cultivated. Nobody knew of its value, only that the silky cotton could be used like Kapok for stuffing furniture, and would not pay to export. The writer merely mentions this to show that it can adapt itself to various climates, although indigenous to the Congo, Uganda, and Abyssinia. While at Uganda, planting rubber at the head of the Nile on the Victoria Nyanza, the writer wanted some rope for a line, and speaking to a native requested him to get some, thinking he would get the bast of a banana. Much to his surprise the boy started pulling this particular plant, and drawing the fibre, then twisting it into rope of remarkable strength. The writer then forwarded samples of rope, fibre, and botanical specimen to the Imperial Institute, London, with the result that the plant was identified as *Asclepias semilunata*, and that the fibre, if properly prepared, was worth on the London market, £35 per ton. The examination of samples sent from Uganda has shown that it is very strong and of excellent quality, and would doubtless be useful for cordage manufacture, but has not yet been exported in sufficient quantities for actual trials on a manufacturing scale. It is possible that the fibre might also be utilised for the manufacture of explosives, but this question is at present under investigation. The writer has sent to the Hon. John Perry, M.P., a sample of the fibre and a quantity of seed to test if it can be successfully grown in New South Wales. The writer feels confident that it can be profitably grown, as its geographical distribution is so well known to him; he has seen it at an elevation of 7,000 feet above sea level at Johannesburg; also at Rhodesia and in Australia, but has not seen it near the coast, though

it may succeed near the sea. The cultivation of *Asclepias semilunata* is simple: sow as you would wheat or oats, after the land has been harrowed; seed thickly so as to produce stems 5 feet to 6 feet long. It will grow on stony land, on the flat or hill-sides, and requires no irrigation, and will withstand drought with impunity. With cheap freight from Sydney to London, let alone local market, this fibre may prove to be a desirable subsidiary industry for New South Wales. The writer, who is an Australian, thinks that the seed must at some time have been introduced into Australia by the late Baron von Müeller, otherwise it is a mystery how he saw it at Coolgardie. The writer trusts that through the columns of the *Agricultural Gazette* more will be heard from tests in New South Wales.

The sample of fibre forwarded by Mr. White to the Hon. the Minister for Agriculture has been submitted to Messrs. Forsyth & Co., rope manufacturers, Sydney, who report as follows:—

> The fibre is equal to Manilla, and is valued at £35 per ton. The length and colour are good. They would give £35 per ton for it, but the fibre must not be less than 4 feet long. The quantity submitted was too small to make a test.

The seed forwarded at the same time has been distributed among the following experiment farms:—Hawkesbury Agricultural College, Wagga, Bathurst, Wollongbar, Belindigarbar (Grafton), Moree, and Pera Bore, for planting in the spring.

An endeavour will be made to obtain, by this means, sufficient fibre for a thorough test by the firm mentioned.

Mr. White, in his letter accompanying the seeds and fibre, emphasises the fact that the price quoted him from London was for the *bast* and not for the *silk cotton* which surrounds the seeds, very like our wild cotton. The seed evidently belongs to a plant of the genus *Asclepias*, and is closely allied to some of our native plants, but in all the botanical literature at our command there is no mention of a species *semilunata*. [Further inquiry will be made.—Ed.]

The Pipe Calabash Gourd.

Some time ago small quantities of the Pipe calabash seeds were sent to this State from South Africa, but it is not known by whom these supplies were obtained. The Department of Agriculture has received an inquiry from a buyer for a quantity of the gourds, and would be glad to get information as to the result of their trial from any persons who obtained and planted the seeds.

An Inexpensive Silo.

F. G. CHOMLEY.

An opportunity was recently afforded me, by the courtesy of Mr. C. W. Bowyer-Smijth, of Green Hills, near Moss Vale, to visit his dairy farm and there see his silo. The photographs which accompany these notes were kindly forwarded by Mr. Bowyer-Smijth, and by referring to the first illustration it will be seen very clearly how advantage has been taken of a rather steep hill in which to excavate the pit, so that filling can be carried on by bringing the loads to the silo on the upper side and throwing them off.

This form of silo has been used by several farmers, and where the natural lay of the land permits, it is a great saving of labour in filling.

The silo, which is 20 feet square by 12 feet deep, was excavated in the hillside as shown, and the roadway leading to it also cut. The walls of the silo are vertical and are lined with split slabs, firmly spiked to horizontal bearers 23 feet long by 9 inches thick, which cross at the corner, and are there held by coach screws; the slabs are butted up to each other, edge to edge, as close as possible, the whole forming as smooth a surface as can be obtained with split timber. The doorway, as shown in the illustration, is formed of sawn hardwood put in horizontally—the pieces of wood forming which are held against the rebate on the door-posts by the silage—the method of fixing a doorway of this description is shown in the *Gazette* for March, 1908, page 244.

The cart-way is cut right into the pit, the bottom of which slightly falls away from the bottom of the silo for drainage, and to secure that stormwater does not lodge in it.

The full cost of each section of the silo is clearly set out in the appended statement kindly handed to me by Mr. Bowyer-Smijth:—

Cost of Silage Pit.

	£	s.	d.
Excavation—			
Pit, 20 ft. x 20 ft. x 12 ft. = 177 square yards	8	17	0
Cart-way to pit 75 cubic yards	3	15	0
Timber—			
12 logs, 23 ft. x 9 in., for foundation of walls (horizontal); 120 slabs for walls (vertical); labour for cutting and splitting	2	0	0
Drawing timber to pit	0	10	0
Labour, timbering pit	1	10	0
Iron—			
Ten 10 in. x 1 in. coach screws	0	3	6
40 lb. 7 in. x ⅜ in. spikes	0	10	0
Fencing—			
Fencing round pit, including three slip rails, 4 chains ..	1	0	0
Total	£18	5	6

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The silage was made from a crop of maize grown on a little less than 20 acres, and was carted to the site and there placed in the silo unchaffed in a similar way to that adopted when building a silage stack. The maize stalks were crossed at the corners, butts outwards, and kept as firmly pressed up to the slabbing as possible—the latter is important, as there is a great tendency, if any undue haste is allowed to interfere with this necessary precaution, for the maize to draw away from the corners and sides, as settlement in the middle, due to more perfect solidification, takes place.

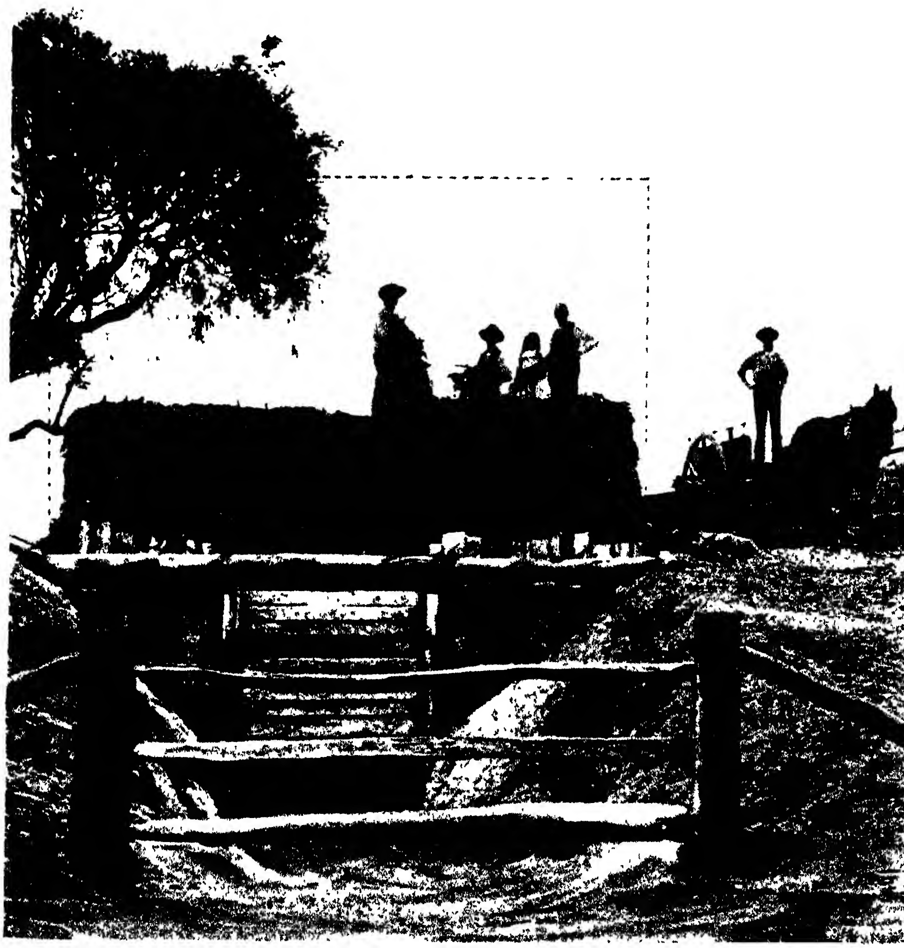
The stack was continued above the top of the silo to a height shown by the dotted lines, about 22 feet. This was kept to the same dimensions as the silo, and the sides trimmed with a hay-knife, and as solidification took place most of the part above the silo sank down, till, on the occasion of my visit, there was only from 1 foot at the sides, to about 2½ feet in the middle, above the walls of the silo; the top was covered with a few loads of "fat hen" and "pig weed," then bark, logs, and stone.

Harvesting Maize for Silage.

Mr. Bowyer-Smijth calculates to have now 100 tons of silage, and allowing half a ton a day for his herd has 200 days feed on hand. The present silo occupies the site of a smaller one erected last year which gave good results; in fact, such good results that he was persuaded of the necessity of enlarging the silo for the present season.

It is well known that to obtain the maximum amount of perfect silage from a given quantity of green fodder it is essential to chaff it in addition to thoroughly treading it into a silo which should be perfectly air-tight with smooth vertical sides free from angles. In this case none of these conditions are found, the maize was not chaffed, the silo is built strongly, but the sides being made of split slabs are necessarily rough, and a large part of the maize was in the form of a stack which ultimately sank into the silo as consolidation due to fermentation took place. What proportion of waste is there, and how far does the amount of waste go as a set-off against the additional cost

of a more expensive silo and chaffing the crop? In this case the average amount of waste is said by Mr. Bowyer-Smijth to amount on the average to 8 inches all round. At the bottom and lower part of sides it may and probably is less, but on the upper part, which was practically a stack, the waste on the sides and corners may be a little more, so no doubt the estimate



Pit Silo, Green Hill's.
The dotted lines indicate height of finished stack, about 22 feet

is near the mark. This, however, will be better calculated when feeding starts, which, as far as present indications go, will not be for some little time, as there is plenty of feed on the farm.

It is rather a hard matter to decide which form yields, under varying circumstances, the best financial result; but the fact that Mr. Bowyer-Smijth had a small silo last season and has a larger one this, and—being in possession

of all the facts and conditions, is therefore better able to judge than anyone else in possession only of bald figures—is satisfied, must be taken by the average practical man as good evidence of the value of the enterprise. With regard to the cost of the silage, this works out at 7s. 11d. per ton, based on the figures supplied me by Mr. Bowyer-Smijth, who kept detailed accounts of the various items making the total cost. Allowing the cost of the silo to extend over, say, five years, the following statement of cost is obtained:—

	£	s.	d.
One-fifth cost of silo	3	13	0
Cost of putting in crop	13	0	6
Cost of cutting, hauling, and stacking maize	23	1	0
Cost 100 tons	39	14	6
Cost per ton	0	7	11

Such excellent feed for dairy stock provided at a cost of less than 8s. per ton is a matter of no little importance in our dairying districts, and, if there are not very good reasons to the contrary, every one should endeavour to provide some feed for the winter or other periods of scarcity to maintain the milk flow. In the United States the cry is, "A silo a farmer must have, even if he has to borrow the money to build it." While we have a shorter winter than most parts of the States the necessity for having a supply of silage is no less, on account of dry spells and the impossibility in some seasons of growing green feed just when it is wanted. With a silo on the farm advantage can be taken of the periods of growth and a sufficient quantity of silage made to tide over the ever-recurring short spells of scarcity.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE.

Summary for May, 1908.

Air Pressure (Barometer.)			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	Per cent. of year's Evaporation.
29·60	30·41	30·25	32·1	79·0	58·2	56·6	35	100	77	·170	2·528	2·266	5
6	17 & 30		8	21			7	1		7			

Rainfall...							
Points	1	1	13	7	8	8½	38½ points.
Dates	3	15	19	20	25	30	

Mean for 16 years = 193 points.

Wind	N	NE	S	SW	W	NW
	1	7	5	9	4	2

Greatest daily range of temperature, 36·3° on 8th.

Days on which shade temperature fell below 40°	32·1°	35·6°	36·3°	30·5°	36·0
	8	9	13	16	26

Frosts: 8th, 9th, 13th, 16th, and 26th.

W. MERVYN CARNE,
Observer.

METEOROLOGICAL BUREAU, NO. 4 DIVISION, NEW SOUTH WALES.

Weather Conditions during May, 1908.

S. WILSON,
Divisional Officer.

AT the beginning of the month an irregular-shaped high pressure covered the mainland of Australia, with the exception of the far western and south-eastern portions, where two depressions were shown. The "low" in the south-east was rather energetic, and had its centre over the ocean to the south-east of Tasmania. Strong westerly to south-westerly winds and rough seas occurred in Bass Strait and over and around Tasmania. Light rainfall was reported from scattered places in the southern border of Australia and along the coast of Queensland. In New South Wales the rain was confined to the Murray, the southern half of Riverina, and here and there on the slopes: elsewhere over the continent the weather was fine and pleasant.

Between the 2nd and 4th the several pressure systems advanced eastward at about the normal rate, the centre of the "high" being now in the south-east of Queensland, and that of the depression between Tasmania and The Bluff (New Zealand). Barometric conditions over the western half of Australia were flat and incipient. With this distribution of atmospheric pressure, further light to heavy rainfall was recorded in West Australia and in the southern districts of the south-eastern States, but fine weather ruled in the interior. Strong winds, attaining the force of a fresh gale, occurred in Bass Strait and Tasmania, with moderate to rough seas. The heaviest reported rainfall was 145 points at Eyre, 137 at Bunbury, 86 at Carnarvon, and 83 at Leeuwin. In our State 50 points at Carcoar was the largest amount.

On the 5th the centre of the high pressure had almost passed off the mainland, but another had appeared in West Australia, with its centre, 30·2 inches, in the south-western corner. Between these two anticyclones there was a new depression centrally situated to the south-west of Streaky Bay, with its northern limits extending inland as far as Charlotte Waters. Strong winds, moderate to rough seas, and a continuation of the rainy conditions in southern districts resulted from this distribution. By the following day the weather over the western half of the continent had come under the control of the high pressure, which had expanded southwards; whilst that of the south-eastern States, the Tasman Sea, and New Zealand was governed by a remarkable Antarctic low-pressure system, whose lowest barometric value, 29·17 inches, was on the east coast of the North Island of New Zealand, resulting in very steep gradients, and, consequently, fresh to very strong gales and rough to high seas between Tasmania and New Zealand. Light scattered rainfall and frosty conditions were reported from our southern districts, and all along the southern seaboard of the continent.

Within the next twenty-four hours the anticyclone covered the whole of the mainland of Australia, with its centre still in the south-west corner. A portion of the Antarctic disturbance was still over Tasmania, but its centre, 29·00 inches, was to the south-west of The Bluff (New Zealand). South-west to westerly gales with light rains still prevailed in Tasmania and the south-eastern corner of the continent, but otherwise the weather was fine generally. At 9 a.m. on the 8th the centre of the high pressure was well established on the mainland between Alice Springs, Esperance, and Adelaide, a d fine, cool weather was experienced throughout, excepting a little patchy rain in extreme southern districts and a light snowfall at Kiandra. Rough seas and boisterous westerlies still obtained in Bass Strait, Tasmania, and the South Coast districts of New South Wales.

The temperature over the State during the first week was, for the most part, cold to mild; the lowest readings occurred at scattered places on the highlands. Nimitybelle registered 21 degrees, Carinda 22 degrees, Kiandra and Glen Innes each 23, Inverell 24, Wellington, Armidale, and Walcha each 26, Warialda and Quirindi each 27, together with many others below freezing point.

On the 9th, at 9 a.m., an energetic disturbance was shown over Victoria and Tasmania, with its central reading, 29·6 inches, in the south-east of the latter State; otherwise the continent was covered by a high pressure of very little character. With this distribution, light scattered rainfall was recorded along the seaboards of Queensland, South Australia, Victoria and Tasmania, as also in southern districts of New South Wales., Strong north-west to south-west winds and rough seas occurred in Bass Strait and on parts of the west coast of Tasmania.

Within the following forty-eight hours the depression had expanded considerably, and covered the south-eastern States and the Tasman Sea as far eastward as New Zealand. The high pressure, on the contrary, had contracted eastward to Queensland and South Australia, and lost upwards of one-tenth inch in its central reading. Another depression appeared in the southern districts of West Australia, and the advance portion of an anticyclone in the north-west corner of that State. Some further light scattered rainfall was reported from the southern districts and coast of New South Wales, as also from here and there on the seaboard of Queensland. The falls were heavier in West Australia and along parts of the southern districts of the continent. Bunbury had 137 points, Eyre 145, Leeuwin 83, Winning Pool 77, and Perth 75 points. Strong south-west winds, reaching the force of gales, occurred in Victoria and Tasmania, with rough seas in the Straits. Over the area covered by the high pressure, fine weather ruled for the most part.

By the 12th the Antarctic depression had advanced from West to South Australia, with its centre to the south of Lincoln. It now controlled the weather between Eyre, Charlotte Waters, and Tasmania, where fresh to strong north-west winds and rainy conditions obtained, and moderate to rough seas along the seaboard. Two high pressures were also shown on the isobaric chart, viz., the rear portion of one over the south-eastern States, and

the advance isobars of another in West Australia. With this distribution, light to moderate rainfall occurred along the southern seaboard of the continent and southern districts of New South Wales. During the next twenty-four hours the centre of the "low" travelled south-eastward to Hythe, in Tasmania, the distance covered in one day being 900 miles, which represents about double the normal rate of translation. All New South Wales, Victoria, Tasmania, and the southern portion of South Australia were now under its influence. The south-west quarter of the continent was under anticyclonic control, the highest pressure value being 30·4 inches, in the south-west corner. Fresh to strong south-west to west winds occurred in the region occupied by the depression, and more light to moderate rainfall along the south coast districts of Australia. Rough seas also obtained between Cape Borda and Gabo. The disturbance shown over the south-eastern States on 13th, after travelling eastward, reached its greatest intensity just north of Gisborne, in the North Island of New Zealand, where the value of its central reading had fallen as low as 29·17 inches, influencing very strong gales and high seas in the vicinity.

The depression over the south-eastern States steepened considerably during the following twenty-four hours. At 9 a.m. on the 14th, the lowest pressure value shown on the chart was 29·1 inches on the west coast of Tasmania. This disturbance was unusually energetic, having nine isobars within a radius of 900 miles, and was responsible for strong west to southerly gales over a great area; as also splendid rainfalls in South Australia and New South Wales excepting the north-east corner. In the former State the distribution of rainfall was light between Farina and Powell's Creek, and moderate to very heavy elsewhere, many stations reporting over 1 inch, and on the Ranges and Lower North over 2 inches. In New South Wales the heaviest falls were 137 points at Kiandra, 102 at Murrumburrah, 95 at Tumbarumba, 91 at Yass, 87 at Tumut and Deniliquin, 82 each at Bungendore and Moulamein, 79 at Marsden's, 74 at Young, 75 at Albury, and 73 at Adelong; the remaining amounts were all under 70 points.

On the 15th the centre of the low pressure occupied a position between Tasmania and New Zealand, having travelled in a south-easterly direction since the previous day, and the barometers over Tasmania showed a rise of upwards of $\frac{3}{10}$ inch. An extensive anticyclone now covered the greater part of the continent, with its centre in the south-west corner.

Some cold weather occurred on the highlands during the week ending the 15th, and snow was reported on three occasions from Kiandra. The lowest temperatures in that period were 24 degrees at Kiandra, 28 degrees at Nimitybelle, Cooma, and Glen Innes, and 29 degrees at Armidale and Coonabarabran.

At 9 a.m. on the 16th an anticyclone of medium intensity covered the whole of Australia, with its centre, 30·4 inches, between Port Augusta and Hay. Light showers resulted all along the southern seaboard and in Tasmania. Light to heavy rainfall also occurred over coastal districts of

New South Wales. Tweed Heads had 137, Byron Bay 110, and Clarence 109 points. On the 17th the centre of the "high" had advanced as far as the centre of the coastline, and was associated with frosty, foggy, showery conditions eastward from the highlands.

By the 18th this pressure system had expanded eastward to New Zealand, and its centre had passed off the mainland to the Tasman Sea; a depression was shown in its outer isobars over the eastern States, whilst another appeared on the fringe of the West Australian seaboard.

Light rainfall was recorded at scattered places in Northern Australia and along the coast of Queensland; but the dip in the isobars over New South Wales was attended by an expansion of the rainy conditions as far westward as the centre of the State. The heaviest falls, however, were recorded from the coast and the highlands. Byron Bay had 410 points, Tweed Heads 365, Mullumbimby 198, Jervis Bay 130, and Lismore 111 points. Other amounts approaching 100 points were: Clarence Heads 98, Camden 94, and Casino 80. The remaining falls ranged from 1 point to 70 points.

During the next twenty-four hours the anticyclone travelled eastward about 500 miles, its centre, 30·4 inches, being now shown in the vicinity of Gisborne, in the North Island of New Zealand. The forward movement gave inducement to the establishment of an energetic Antarctic disturbance to the south-west of The Leeuwin. This disturbance resulted in unusually heavy and beneficial rainfall in the western State; 286 points were recorded at Geraldton, 227 at Carnarvon, 200 at Hamelin Pool, 187 at Perth, and 98 at Onslow. Fierce northerly squalls and rough seas were also reported from the south coast. A depression still existed over the eastern States, and was responsible for further light to heavy rain in various districts, chiefly eastern. In New South Wales, it was confined chiefly between the coast and the slopes, although isolated registrations occurred on the plains. The heaviest falls were 384 points at Clarence Heads, 339 at Byron Bay, 236 at Lawson, 158 at Mullumbimby, 154 at Sutton Forest, 140 at Lismore, 139 at Nowra, 125 at Moss Vale, 117 at Newcastle, 110 at Casino, and 109 at Bowral. Many other amounts also approached 100 points.

Some heavy falls were also recorded in Queensland, the chief being 150 points at Townsville, 119 at Mackay, 112 at Brisbane, and 103 at Lochnagar.

At 9 a.m. on the 20th the centre of the high pressure was well established in New Zealand, having gained $\frac{1}{10}$ inch, which brought its value to 30·5 inches; and the depression which on the previous day was over the eastern States, had advanced eastward just beyond the coastline.

The Antarctic disturbance now covered the area south of lines joining The Leeuwin, Charlotte Waters, and Adelaide, its centre, 29·7 inches, being situated south from Eucla and Eyre, on the Great Australian Bight. The advance portion of another "high" was also shown over West Australia, where further good rainfall was recorded. Nullagine had 158 points, Cossack 126, Menzies 101, and Nungarra 100 points. Fierce squalls, with hail, and rough to very rough seas, were reported from stations on the Great Bight.

Many fogs occurred on the tablelands and slopes of New South Wales, and light to heavy rainfall with disturbed seas along the seaboard, the latter being probably due to the existence of steep gradients between the anticyclone in New Zealand and the depression on our coast.

On the 21st the centre of the high pressure was still centrally situated in New Zealand, but the main body of it had passed from the mainland of Australia to the Tasman Sea, its former position being occupied by the "Antarctic low," which had made its way further eastward, but in a comparatively enervated condition, the centre now being well to the west of Tasmania. Rough seas still persisted along our coastline and in Bass Strait, but the rainy conditions with the disturbance had worked south of New South Wales, causing scattered light to moderate falls along parts of the southern seaboard of the continent and in Victoria.

Every day during the week ended the 21st, except the 21st, rainfall was recorded on the coast of New South Wales, in parts heavy, and now and again extending as far westward as the slopes, but the falls there were for the most part light. On the 20th fogs were very prevalent over the slopes and tablelands, and during the week frosty conditions were reported from many highland stations. Temperatures were comparatively mild during the greater part of the week, on the 20th not one station being below freezing point, and on the 19th only two, viz., White Cliffs 30 degrees, and Euston 31 degrees, both in the Western Division of the State. The lowest reported temperatures were: Kiandra 24 degrees, Nimitybelle 25 degrees, and Rockley, Coonabarabran, and Glen Innes each 29 degrees.

At 9 a.m. on the 22nd an anticyclone covered the whole of Australia, with its centre, 30·3 inches, situated between the southern gold-fields of Western Australia and Port Augusta. This distribution of pressure was attended by fine weather inland and light rainfall along the southern seaboard of the continent. Light to moderate rainfall was also recorded at scattered places on the coast of New South Wales, and an isolated heavy fall of 162 points at Newcastle.

Within the next forty-eight hours, although the anticyclone covered practically the same area as on the 22nd, its centre half gained $\frac{1}{10}$ inch pressure value and expanded both eastward and westward, and on Monday, 25th, extended from Perth in West Australia to Hay in New South Wales. More light rainfall occurred at scattered places along the south coast of the continent, but elsewhere fine settled weather prevailed, with south to south-east and easterly winds.

On the 26th little or no forward movement was shown in the high-pressure system, but its centre, which was now 30·5 inches, had contracted and again covered an area between the southern gold-fields of Western Australia and the southern part of South Australia. More light rainfall was registered along the coastline between Adelaide and Manning Heads in New South Wales, and strong south-west winds with rough seas occurred between Victoria and Tasmania. Otherwise the weather over the continent was fine generally.

At 9 a.m. on the 27th, the isobaric chart showed an example of pressure distribution over Australia which is typical of the winter season.

The isobars of the anticyclone which covered the whole continent were arranged symmetrically around a central area, 30·6 inches in value, located a little to the south-west of Adelaide and Robe. Rough seas occurred along the coast between Wilson's Promontory and Newcastle, and cold, frosty conditions prevailed over a very extensive area. In New South Wales frosts were reported from Riverina district and the slopes and tablelands; light to heavy rainfall was recorded also on our coastline from Kiama to Port Macquarie and at a few places in the Hunter and Manning districts. The heaviest fall was 127 points at Newcastle.

By the 28th the centre of the "high," diminished in value by $\frac{1}{10}$ inch, was shown between Wilson's Promontory and Adelaide. Its most western isobars had also worked a little eastward, allowing space for the development of a depression in the western district of West Australia, which at 9 a.m. appeared in the south-west corner, but during the previous night had probably affected the more northern portion of that State, for light to heavy rainfall was recorded west of a line joining Onslow in the north-west and Esperance on the south coast. The heaviest registrations were: Winning Pool 215 points, Cape Leeuwin 158, Perth 80, Bunbury 63, and Carnarvon 62, the remaining amounts being under 50 points.

On the coastline of New South Wales, light to moderate rainfall was registered between Crookhaven and Port Macquarie.

On the 29th the anticyclone which, during the past week, had controlled the weather of the continent, was shown over the eastern half, somewhat enervated, with its centre covering the greater portion of the south-eastern States. Another "high" had appeared in West Australia, and between the two systems was the depression, which had moved about 600 miles eastward from Albany since the previous day after having caused extensive, though for the most part light, rains in West Australia.

During the week ended the 29th very low temperatures were registered in many inland districts. Rockley and Kiandra had the lowest, 18 degrees on the 26th; Glen Innes 22 degrees, Nimitybelle 25 degrees, Armidale and Coonabarabran 27 degrees, Coolamon and Murrumburrah 28 degrees, and Orange, Tenterfield, and Inverell each 29 degrees.

A considerable change was effected by the 30th in the distribution of atmospheric pressure, for the rear isobars of the anticyclone had expanded westward about 1,000 miles, the system as a whole having an elongated shape, with its highest barometric values along our coastline. With this alteration in the arrangement of the isobars, the northern portion of an Antarctic depression appeared over the Great Bight, extending from the Leeuwin to Cape Otway.

During the month of May, the rainfall over New South Wales was for the most part below the average. Only a few stations, and those widely scattered, had falls in excess of the average.

The pressure systems which travelled across Australia were all more or less of the winter description, the anticyclones being of huge dimensions, and covering the whole of the continent. Consequently, some very low temperatures were experienced at many stations in the various subdivisions of the State.

The distribution of the rainfall in New South Wales during May, 1908, was as follows:

		Departure from normal. Points. Above.		Below.
North Coast	from	262	to	354
Hunter and Manning	,,	38	to	449
Metropolitan	,,			172 to 339
South Coast	,,	--		54 to 434
Northern Tableland	,,	—		121 to 191
Central Tableland	,,	21	to	259
Southern Tableland	,,	26	to	241
North-western Slope	,,			17 to 232
Central-western Slope	,,			118 to 162
South-western Slope	,,	34	to	116
North-western Plain	,,	--		95 to 198
Central-western Plain	,,	—		59 to 166
Riverina	,,	10	to	116
Western Division	,,			7 to 144

COMPARISON WITH INDIA.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia as far as data are available, for the month of May, 1908:—

	Departure from normal. Pressure.	Departure from normal. Temperature.	General Conditions (referring to State as a whole).
	inches.	degrees.	
India	+ ·01	+ ·08	Dry.
Sydney (N.S.W.)	+ ·05	+ 1·5	Below normal, excepting at a few scattered places, chiefly on Southern Tablelands and Slopes, and on North Coast.
Melbourne (Victoria)	·02	- 1·0	Rainfall above normal over Western half; normal in North and North-east. Considerably below elsewhere, especially in South-east.
Adelaide (S.A.)	+ ·02	0·7	Wet.
Perth (W.A.)	·01	0·8	Kimberley and Eastern Gold fields, and portion of extreme South-west below normal; elsewhere above.

Judging from the above table, India and Sydney have been respectively dry and below normal chiefly, with both pressure and temperature in excess. Melbourne, Adelaide, and Perth, on the other hand, have had rainfall for the most part above normal, with either both elements in defect, or one in excess and the other in defect.

Seasonable Notes.

GEO. L. SUTTON.
Wheat Experimentalist.

Spring Crops.

THE 1908 planting season is now over, and, as the planting is completed, the teams should be utilised to commence ploughing for next season's crops, both spring and autumn.

Land intended for spring crops should be broken up at once and harrowed down at favourable opportunities, to conserve the moisture and bring it into good tilth.

In the past, spring and summer crops have failed in many districts, not because the crop or climate was unsuitable, but because the preparation of the soil had been wrong. To plough the ground in the customary way, just before the crop is to be planted, is to court failure unless the district is favoured with abundant rains after the planting. To plough and winter-fallow land intended for summer crops is to eliminate a large amount of that element of speculation regarding their success which has characterised such cropping in the past. To plant such crops in drills and to cultivate the soil between the drills is to ensure success in any season but one of absolute drought.

Fallowing.

Land intended for next season's rape and wheat crops should, if possible, be ploughed during the winter, and before the harvest commences. This will be found beneficial in all our wheat districts, but will be particularly beneficial in districts where the autumn rainfall is scanty or uncertain. In such districts, with the ploughing done in the winter and the fallow worked during the summer, planting can take place in the autumn with every certainty of the seed germinating when it is planted. This is the practice followed at Coolabah, and there the wheat is up and looking as well as could be desired, though with the ordinary practice in vogue of ploughing just before seeding, sufficient rain has not fallen to admit of ploughing being performed and to germinate the seed.

Old Cultivation Paddocks.

Inquiries are to hand as to the most suitable grasses to sow in old cultivation paddocks. Difficulty is experienced in replying satisfactorily to these, as it is almost impossible to obtain seed of our native grasses, which are the most valuable for this purpose, and in addition, there is very little information available as to which grasses are most suitable for different

districts when sown in cultivated land. Seeing the value and importance of grasses to landholders in this State, there should be on every holding at least a small plot devoted to the trial of grasses.

Those who desire to do so can obtain small trial packets of many of our native and other grasses from the Cowra Experiment Farm.

Of the grasses of which seed can be obtained, Rhodes Grass will probably be found admirably suitable for planting in the wheat districts, but sufficient experience has not been obtained to warrant recommending the extensive planting of it.

A reminder is given that there are two varieties of Rhodes Grass, viz., *Chloris Gayana* and *Chloris virgata*. *Chloris Gayana* will probably be more suitable for dry conditions than *C. virgata*.

Assuming that the object of planting the cultivation paddocks with grass is to renovate and clean them, these objects can be profitably, and possibly more expeditiously, obtained in another way, by planting rape in such paddocks next February. To ensure success the ground should be broken up now and worked during the summer. If this be done the rape can be planted in February with every prospect that it will provide green, succulent feed during the autumn and winter. By feeding off the rape, wild oats, and other weeds which grow, the land will be improved, and by ploughing in the winter or spring before the oat seeds, the weeds will be killed and the paddock cleaned.

Rape.

Reports are to hand of aphis attacking early sown rape. Such attacks, though expected in the warm spring, are unusual in the cold autumn, and are possibly due to the dry weather experienced.

Sheep evince a reluctance to graze such rape, but eventually take to it if kept on it. The remedy seems to be to keep the early sown rape eaten down until the cold weather sets in.

The value and advantages of rape are being more and more realised by farmers each year, and, in consequence, the area planted with it is increasing, and it will still further increase as its possibilities are realised. This year a farmer in the Cowra district planted rape at the beginning of the year, fattened sheep on it, and then ploughed the ground, which is now seeded with wheat.

This instance shows how rapid is the growth of the rape plant, and, *in districts where the rainfall renders such intense cultivation possible*, what profit can be derived from its cultivation.

Orchard Notes.

W. J. ALLEN.

JULY.

Planting and Refilling Orchards.—Good seasonable rains have fallen in many parts of the State during the last month, and in consequence the soil has been in splendid condition for the planting of new orchards, and refilling in those already established. If such planting has not been completed, see that it is finished this month, as the sooner now that young deciduous trees and vines are planted the better.

Pruned Cleopatra Apple-tree (12 years old).

Varieties of Apples to Plant for Export.—Up to the present we have only proved a few of the many varieties of apples we are growing to be suitable for export, the two best being Cleopatra and Jonathan; Munroe's Favourite, Five Crown, and Granny Smith are also very good. The Buncombe is an apple which is doing well in our cooler climates, but is rather lacking in

flavour, and does not colour quite early enough for the English market. The Rome Beauty is also a good keeper and good flavoured variety, but it, too, ripens somewhat too late for the Continental market, though it would suit the American market. Esopus Spitzenberg does remarkably well in many of our apple-growing districts, but up to the present we have not tested its carrying quality. Pomme de Neige is a beautiful medium-sized dessert apple for the local market.

Fair Sample of unpruned Cleopatra Apple-tree (12 years old).

Pruning. This work should be completed this month, in order to give the orchardist time to apply the yearly spraying of either lime and sulphur, or Bordeaux mixture. At our Wagga orchard we have used the following winter spray with excellent results:—Take 12 lb. of sulphur and 6 lb. of properly slacked lime, and boil in 100 gallons of water for three or four hours.

At the Agricultural Experiment Station, Illinois, United States of America, the following spray has been found the cheapest and best:—15 lb. of best lime, and an equal weight of sulphur to 50 gallons of water. The sulphur, after being mixed with enough water to form a thin paste, was put into 12 gallons of water, nearly at the boiling point—the lime was then added,

and the mixture boiled for forty minutes with the necessary stirring. The whole was strained into a 50-gallon tank, which was then filled with water. This latter is claimed to be the most effective out of eleven sprays tested in the destruction of San José scale. It is important that the operator should bear in mind that solutions made by stirring the sulphur into the hot water first, and adding the lime to this mixture, are more efficient than if the order of procedure is reversed.

Citrus Crop.—Notwithstanding the fact that the past season has been a very unfavourable one, there can be seen in some of our young citrus orchards some of the finest crops of oranges as regards size, quality, and crop that one could wish to see. The older trees, however, in many places, have very light crops.

From time to time inquiries are received as to the cost of the various chemicals used for the different sprays and fumigating. Herewith is a list which will be of interest to growers, showing the latest quotations :

QUOTATION FROM TWO WHOLESALE HOUSES.

1.

Cyanide of Potassium—		
	7 lb. lots, @ 1s. 2d. per lb.	56 lb. lots, @ 1s. per lb.
	14 ,, ,, 1s. 1d. ,,	1 cwt. ,, 10d. ,,
	28 ,, ,, 1s. 1d. ,,	
Sulphuric Acid..	40 lb. jar @ 2d. per lb.	
Fish Oil	1 gallon lots, @ 4s. per gallon; taking 10 gallons, 3s. 6d. per gallon	
Resin—		
	1 lb. lots, @ 2d. per lb.	112 lb. @ 12s. per cwt.
	28 ,, ,, 1½d. ,,	
Soda	1d. per lb., 5s. per cwt.	
Bluestone—		
	7 lb. lots, @ 5d. per lb. } 30s. per cwt.	
	28 ,, ,, 4d. ,, }	

2.

Cyanide of Potassium—		
	7 lb. lots, @ 1s. per lb.	1 cwt. lots, @ 9½d. per .
	35 ,, ,, 10d. ,,	
Sulphuric Acid—		
	5 lb. for 1s. 6d.	40 lb. for 8s. 6d.
	10 ,, 2s. 8d.	160 ,, 32s.
	20 ,, 5s. 4d.	
Fish Oil—		
	1 gallon for 5s. }	Note.—Casing and packing extra.
	5 gallons ,, 21s. 3d. }	
	10 ,, ,, 41s. }	
Resin—		
	7 lb. lots, @ 2d. per lb.	28 lb. lots, @ 1½d. per lb.
	14 ,, ,, 1¾d. ,,	112 ,, ,, 12s. 6d. per cwt.
Soda—		
	7 lb. lots, for 7d.	28 lb. lots, for 1s. 9d
	14 ,, ,, 1s.	112 ,, ,, 5s 6d. per cwt.
Bluestone—		
	7 lb. lots, @ 4½d. per lb.	28 lb. lots, @ 3½d. per lb.
	14 ,, ,, 4d. ,,	1 cwt. ,, ,, 30s. ,, cwt.

Suitable scales can be obtained from any of the Ironmongery establishments, from 1s. 6d. upwards.

Farm Notes.

Hawkesbury District—July.

H. W. POTTS.

The weather conditions during last month were seasonable. Frosts prevailed early, and, in consequence, the couch and other useful grasses have suffered. The rains have been light and farming operations are well forward. Moisture in the soil is by no means ample, and it is difficult at this stage to forecast the ultimate crop returns. The early sown wheat, barley, and oats are looking well.

The maize harvest may be completed this month. The earlier collected maize will be dry enough at this stage for husking and shelling.

The crops have been very light this year, and, in many instances, a failure.

The preparation of the land intended for our main crop, maize, must have attention this month. The Hawkesbury Valley soils, unlike those of the more favoured northern rivers, are not so rich in plant food; moreover, they have been cropped longer, and hence manuring and cultivation are essential as well as moisture to ensure a profitable crop.

Those who adopted the sensible course of growing cowpeas last summer as a fertilising crop will secure a benefit, as will also those who put in a cover crop of rape in autumn. The latter has given good results following on the ample rainfall in February.

Where the crop has been grazed by sheep or pigs the land has been cleared and restored to normal fertility, especially suitable for the deep-rooted maize plant.

This month the heavier stiff soils should be subsoiled to loosen and stir them, to enable them to absorb all rainfall, and hold as a reservoir. The moisture-storage capacity of the subsoils is a leading factor in the successful growth of the crop.

Land may also be got ready and cultivated for early summer crops such as millet, sorghum, pumpkins, and marrows. Wheats: The last sowings of wheats for the season may now be put in, and where barley is required for grain, such as the English and Cape varieties may be sown. Skinless barley may also be sown for a continuation of hay supplies. The last crops of oats may be sown. The quickly growing crops of rape and mustard are worthy of further attention, and may be grown as catch crops on land that may be utilised for maize or sorghum.

Garden Notes.

W. SANDERSON.

JULY.

As July is generally a cold month very little growth can be expected from seedlings that have recently been planted out; however, the frosty weather will do a large amount of good in checking many insect pests, especially cabbage moth, which causes so much trouble.

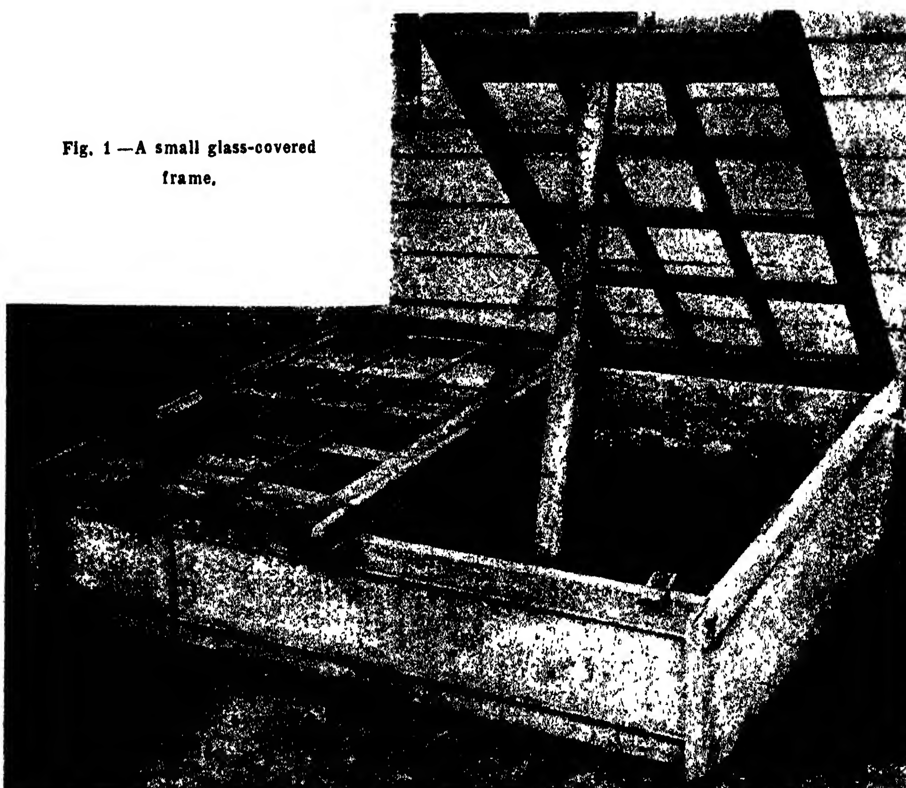


Fig. 1.—A small glass-covered frame.

Harsh westerly winds frequently prevail during this month, which are a considerable drawback to the garden, making the soil very dry, consequently the plants will require plenty of water to keep them growing.

Watering soil that has become very smooth and hard is practically of little use; in fact, it is only so much water wasted. It is better to have the soil in a loose, rough condition so that the water can soak in, and mulch the surface

with old rotten straw, grass, leaves or any litter that will prevent evaporation of the moisture that is absolutely essential to the production of good vegetables.

In the warmer or coastal districts some preparation should be made now for raising seedlings; for this purpose a frame may be made that will answer the purpose and the cost of which will be almost nil. Obtain any rough timber, slabs, boards or old cases for the sides and ends—a convenient size would be 6 feet long by 3 ft. 6 in. wide, 3 feet high at the back, sloping to 1 ft. 6 in. in front; glass is generally used for a covering, but provision must be made for ventilation. This is most easily obtained by inserting a piece of stick under one edge of the glass covering (See Fig. 1).

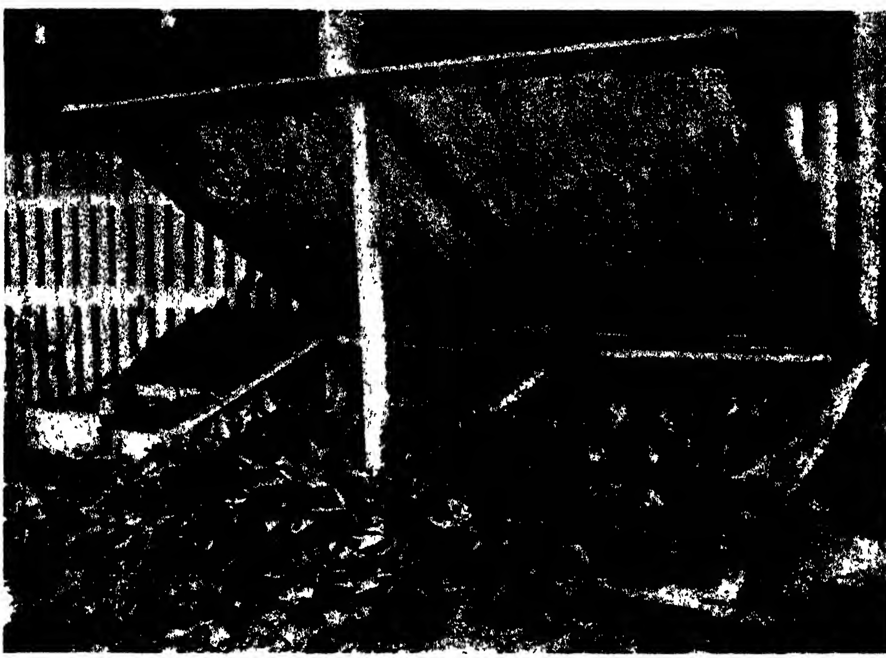


Fig. 2.- A rough frame covered with hessian.

A blind made of hessian on a roller should also be provided, to lower over the glass when any shade is required, or the young plants may be burnt off.

This frame should now be half filled with fresh stable manure, on which should be placed 5 or 6 inches of bush rakings or leaf mould. Sufficient heat will be immediately developed to start any seeds planted in it.

The seeds should be sown in shallow boxes or pans and placed in the surface soil to a depth of 3 to 4 inches.

Instead of the glass covering a blind of hessian may be used, as shown in Fig. 2; but if wet weather sets in the manure soon loses its heat, and the seedlings die off with the cold.

When the heat in the frame is dying, the seed boxes or pans may be removed while a little fresh manure is mixed through that already in the frame, or a quantity of fresh stable manure can be piled up against the outside; this will create sufficient heat to bring the seedlings along.

When they are strong enough they should be pricked out into boxes and hardened off, in any warm and sheltered place, subsequently transplanting them into their permanent position when all danger from frosts is past.

The slight trouble entailed raising early plants is amply repaid, as they will come in at a time when fresh vegetables are rather scarce.

Any new ground that is to be added to the vegetable garden should be well worked now: manure should be put in at the same time, so that it will be well rotted before any crop is sown in the spring. If the manuring is deferred until the planting out of seedlings, the chances are that if a dry spring follows, instead of the manure benefiting the plants it will tend to create heat, and do more harm than good, unless a good supply of water is available.

For spring planting it would be well to choose seeds and plants of the very best varieties, sorts that will suit the summer months, especially the cabbage family. For instance, St. John's Day Cabbage invariably produces good heads quickly; whereas many other sorts fail or take so long to produce hearts that the cabbage moth ruins any chance they might have had. The same applies to other vegetables, and even if a little more has to be paid for good seeds or plants it is well to do so, and insist on having the best—they are the cheapest and most profitable in the end.

When sowing seed, especially cabbage, cauliflower, and broccoli, care should be taken not to sow the seed too thickly. Thick sowing is a great mistake as the seedlings become leggy, with very little substance in them, and frequently much trouble is experienced in getting them to make a start when planted out; whereas, if the seed had been sown thinly they would have been sturdy, well-grown and strong-rooted plants, and when raised for transplanting they would carry a fair quantity of soil on their rootlets, consequently they would hardly feel the shift.

In districts free from frost, any sufficiently advanced seedlings of tomato, cucumber, and capsicum may be planted out.

Asparagus.—If a bed is to be established, lose no time in getting the plants and setting them out. Attend to any established plants; a heavy dressing of well-rotted dung should be forked in, avoid cutting the crown of the plants during the operation.

Broad Beans.—In the cooler districts a sowing might be made, and any early plantings should be cultivated thoroughly, for by this time they should be making good headway.

Carrots.—Sow seed in any land that was well manured and a crop of cabbage has been taken off; this is the best possible preparation of the ground for carrots. Sow early varieties, such as Short Horn, &c.

Leek.—Sow a little seed and transplant any seedlings that are available in good land, and those that are coming along might have a little earth drawn up to them to blanch the stems.

Endive.—Plant any seedlings that are sufficiently grown. This salad vegetable is very useful, the peculiar bitter flavour making it very much appreciated by many people.

Peas.—Sow a few rows and keep any previous or growing crops well cultivated; also see that they have plenty of support in the way of sticks to prevent the heavy winds from destroying the haulms.

Spinach.—Sow a little seed and plant out any seedlings that may be ready. Spinach is well worth growing in every garden, for, apart from being easily grown, it produces more for the space of ground occupied than many other vegetables.

Turnips.—Thin out any seedlings that are coming on, and keep them growing so that they will not be pithy or strong.

Herbs.—See that the stock of herbs is not getting low; there should always be plenty for the kitchen use.

Flowers.

This is a very good time of year to undertake any alterations in the flower garden in the way of making new borders, grass plots, lawns, walks, &c. Hedges might also be trimmed up or new ones planted.

For making hedges, there are many varieties of plants to choose from. Amongst those which look very well are, Saltbush, Duranta Plumierii, Hawthorn (May), Olive (common), Pittosporum (of varieties), and Japanese Privet (*Ligustrum lucidum*).

All deciduous plants might now be put out. For making some early bloom many varieties may be obtained, such as Deutzia, Diervilla or Weigelia, Guelder Rose, Pomegranate, Magnolia, Spirea, Lilac, double-flowering Plums of varieties (*Prunus triloba* and *Prunus mume*), also double-flowering Peach, Cherry, and Hawthorn of various colours. Any of these should have a place in the garden as they make a mass of bloom in the spring and are very attractive.

Dahlias should now be taken up and stored until the next planting season. Chrysanthemums may be dug up and the young offshoots rooted for spring planting as they produce better blooms than when the old clumps are allowed to remain for flowering next year.

If sufficient seedlings of spring flowering plants have not been raised they should be put in at once. Any pansies that have not been planted out, should be attended to as soon as possible.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Deniliquin P. and A. Society	L. Harrison	July 16, 17
Hay P. and A. Association	G. S. Camden	,, 22, 23
Condobolin P. and A. Association	G. Bennett	Aug. 4, 5
Narandera P. and A. Association	W. T. Lynch	,, 5, 6
National A. and I. Association of Queensland	C. A. Arvier	,, 10 to 15
Forbes P., A., and H. Association	N. A. Read	,, 12, 13
Murrumbidgee P. and A. Association	A. F. D. White	,, 25, 26, 27
Gunnedah P., A., and H. Association	M. C. Tweedie	Sept. 1, 2, 3
Grenfell P., A., and H. Association	Geo. Cousins	,, 2, 3
Parkes P., A., and H. Association	G. W. Seaborne	,, 2, 3
Germanton P. and A. Society	J. Stewart	,, 2, 3
Albury and Border P., A., and H. Society	W. I. Johnson	,, 8, 9, 10
Young P. and A. Association	G. S. Whiteman	,, 8, 9, 10
Cootamundra A., P., H., and I. Association	T. Williams	,, 15, 16
Molong P. and A. Association	C. E. Archer	,, 16
Cowra P., A., and H. Association	E. A. Field	,, 16, 17
Corowa P., A., and H. Association	J. O. Fraser	,, 22, 23
Temora P., A., H., and I. Association	John Clark	,, 22, 23, 24
Queanbeyan P. and A. Association	E. O. Hinksman	Oct. 1
Lismore A. and I. Society	T. M. Hewitt	Nov. 11, 12, 13
Berry Agricultural Association	A. J. Colley	,, 24, 25, 26, 27

1909.

Society.	Secretary.	Date.
Kiama A. Association	R. R. Somerville	Jan. 26, 27
Kangaroo Valley	E. G. Williams	Feb. 18, 19
Gunning P., A., and I. Society	W. T. Plumb	,, 25, 26
Tenterfield P., A., and M.	F. W. Hoskins	Mar. 2 to 6
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 10, 11
Newcastle A., H., and I. Society	C. W. Donnelly	,, 11, 12, 13
Inverell P. and A. Association	J. McIlveen	,, 16, 17, 18
Camden A., H., and I. Society	C. A. Thompson	,, 17, 18, 19
Upper Hunter P. and A. Ass., Muswellbrook	J. M. Campbell	,, 31 Apl. 1, 2
Bathurst A., H., and P. Association	G. W. Thompson	Mar. 31 Apl. 1, 2
Durham A. and H. Association, Dungog	C. E. Grant	May 5, 6

[2 Plates.]

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VOL. XIX. PART 8. AUGUST 3, 1908.

Agricultural Gazette of New South Wales.

Artesian Irrigation.

AN ANTIDOTE FOR ALKALINE WATERS.

R. S. SYMMONDS.
Chemical Laboratory, Department of Agriculture.

THE injurious effects of alkaline artesian water on vegetation and the soil, when used for irrigation purposes, are unfortunately too well established. A perusal of the evidence given by pastoralists and others before the Royal Commission on the Administration of the Lands Department, shows clearly the difficulties met with in their attempts to utilise artesian water for agricultural purposes. In this connection, Exhibit No. 334 is of particular interest, and is as follows:—

"82, Pitt-street, Sydney, 21/9/05.

"His Honor Mr. Justice Owen,

"Lands Commission, Lands Office, Sydney.

"Sir,

"May it please your Honor: as much evidence has been tendered in connection with artesian bore-water and its influences on the soil and vegetation in the Coonamble district, I should like to state the result of my own personal observations.

"I have had some four years' experience with bore-water on Quambone Station, and took particular interest in practically testing its efficacy when used for irrigation purposes. My late employer, Mr. John Hain, was very anxious to make a success of irrigation by bore-water, and had it used in various ways, but without success.

"In the first place, I might state that when first emitted from the bore, it gave off a rather offensive smell, similar to burning sulphur. I also noticed that it had a similar action to that of sulphur on brass, as it turned it nearly black. The water also leaves a white deposit along the banks of the drains for several miles, and when allowed to spread over the land it forms a crust of blue-black colour, similar to that made by exploded gunpowder.

"It is almost impossible for young plants immediately after germination to burst through, and those which do are either very stunted or die altogether after a very short time. Owing to the dam on the creek being washed away, it became necessary to use bore-water on the Quambone vegetable garden, but the effects were disastrous. Strong healthy plants soon became smothered with aphides. Seeds were germinated with rain water, and the plants raised therewith until fit for transplanting, but when the bore-water was applied they died off. Fruit-trees, which had hitherto thriven in dry seasons, under the influence of creek water, became unhealthy when bore-water was applied.

The leaves turned yellow and dropped off, and several of the citrus trees died, while all the peach and Japanese plum trees died outright.

"Lime was used in the soil by recommendation of experts to counteract the effects of the salts in the bore-water, but it failed to have the desired effect. I tried lucerne growing, but the young plants which appeared healthy at first soon died, both when the water was carried by furrows through the land, and when it was allowed to flow over the surface. The roots rotted and turned black, and when the plant was pulled up it left a black outside skin in the ground.

"The soil in the Quambone gardens is of a rich sandy loam of deep tilth, well drained, and very suitable for irrigation. Bore-water had not only the effect of destroying vegetation at the time of its application, but for some considerable time afterwards it would not successfully produce crops when rain water was used, thus proving that the land was practically sterilised.

"My experience with bore-water, after trying various methods of using it on different kinds of crops, is that it is of little or no value, and by continually using it the soil becomes absolutely barren.

"I realised the immense value that bore-water would be to that arid part of the country, if fodder crops could be successfully grown by it, and during some four years I endeavoured unremittingly to prove its utility.

"No doubt the development of the artesian system has done much to render the land more safe for pastoral purposes, as stock are very fond of it, and it can be distributed in drains throughout the country, thus saving the stock the otherwise necessity of walking long distances for water; in which case they not only lose their condition by the exercise, but cut up the feed.

"Yours, &c., T. W. SANDS."

"P.S.—The bore-water had a similar effect upon the flower garden to that on the vegetable garden. When water was turned into natural shallow swamps, the grass grew most luxuriantly for the first year; the second year not nearly so well; and the third year, scarcely any grass, but in place of grass a growth of rushes appeared which are useless for fodder.—T.W.S."

ANALYSES of Artesian Waters, by Mr. J. C. H. Mingaye.

Grains per Imperial Gallon.

Name of Bore.	Sodium Carbonate.	Potassium Carbonate.	Calcium Carbonate.	Magnesium Carbonate.	Sodium Chloride.	Potassium Chloride	Magnesium Chloride.	Sodium Sulphate.	Potassium Sulphate.	Iron Oxide and Alumina.	Silica.	Total, solid matter.
Moree	39·259	1·101	·642	·295	7·029	...	...	...	...	trace	1·456	49·782
Pera	33·118	1·225	·849	·402	7·600	...	...	...	...	·252	1·064	45·076
Quambone ...	28·280	·493	1·800	·399	2·099	...	...	·504	...	trace	1·596	35·224

Speaking generally, the saline substance in artesian water consists chiefly of carbonate and chloride of soda. The carbonate of soda not only dissolves

and destroys the humus in the soil, it also attacks and combines with silica and produces silicate of soda—a substance known in domestic circles as "waterglass," which is used on account of its cementing properties for preserving eggs. It is also used for cementing together sand, in the manufacture of grindstones.

The cementing and hardening properties of the silicate thus formed are very clearly seen when testing the capillarity of soil which has been irrigated with bore-water. The capillary rise of water in unirrigated soil (light loam) from Pera is 10 inches in three hours, and only ¾ of an inch in twenty-four hours in the same class of soil which had been irrigated with alkaline water.

The capillary power of unirrigated soil (stiff clay) from the vicinity of the Moree bore is 3½ inches in three hours, and soil selected from a channel along which the artesian water had been running, showed a capillary rise of ⅜ of an inch in three hours, and only 1¼ inch in forty-eight hours.

It has also been noticed at the Moree farm lucerne plots, where the water was run along furrows 8 to 10 feet apart, that before the centre was soaked the plants near the furrows were drowned, unless great care was exercised. It was, therefore, found necessary to resort to flooding quickly with a good flow of water.

The estimated area of the great artesian basin is 364,000,000 acres (*more than ten times the area of England*), 53,000,000 acres being situated in New South Wales. A method which would successfully and economically correct the injurious effects of artesian water would be of immense value; while a scheme that would not only correct those evils, but convert the soil into a condition of extreme fertility, would be of incalculable value.

Milton Whitney, Chief of the Bureau of Soil, United States Department of Agriculture, when writing of American alkaline soils in Bulletin No. 21, says: "The subject of alkali has been a source of much anxiety to our western people, and the vast injury that has been done through the occurrence of alkali has prejudiced outsiders in irrigation enterprises to such an extent that in many communities the subject has been exceedingly unpopular, and any reference to it in connection with certain localities has been vigorously opposed and criticised.

"The value of this alkali land is nominal, the greater part of it being priced at $10 per acre or less. Were this land in a fertile condition, its value under irrigation would be at least $75 per acre. If it can be brought into a state of fertility its value will, therefore, be increased $65 (£13) per acre."

A scheme which would increase the value of that portion of the 364,000,000 acres suitable for irrigation by, say, £1 per acre, is worth more than a passing thought; in fact, it would be an achievement of the greatest national importance.

It occurred to me that the alkali in our artesian waters could be neutralised by nitric acid, and thereby converted into a valuable fertiliser—nitrate of soda—upon which the world has been spending, for agricultural purposes, something like £14,000,000 per year. In order to test this idea in a practica

manner, I obtained some alkaline soil which had been under irrigation by artesian water, and on September 28th, 1906, filled three 6-inch flower-pots with the soil, No. 1 being the soil as obtained, Nos. 2 and 3 were treated with nitric acid. Two grains of wheat were sown in each pot and allowed to mature. The wheat was cut on January 28th, 1907, and the grain weighed, which gave the following results:—

No. 1, untreated	2·65	grammes of wheat.
No. 2, treated	11·30	,, ,,
No. 3 ,,	14·40	,, ,,

The latter showed more than five times the yield of the first named, which was considered a very satisfactory result.

Fig. 1.

In order to make quite sure, I repeated the experiment in duplicate on February 2nd, 1907, and the illustrations, Figs. 1 and 2, show the latter series of experiments; and although the season (winter) was against the growth and ripening of the grain, the results showed an increase of from eight to ten fold.

The pot on the left of each illustration, Nos. 1 and 5, contain the alkaline soil untreated; the other pots contain the same soil in which the injurious effects of the alkali have been corrected by the addition of nitric acid. Nos. 2 and 6 received ·2 per cent., Nos. 3 and 7 received ·5 per cent., and Nos. 4 and 8 received 1 per cent. nitric acid.

Two grains only were grown in each pot; consequently it is fair to assume that the "stooling" properties of wheat are greatly assisted by the process, and as the pots containing ·2 per cent. nitric acid showed an increase in yield practically equal to those containing 1 per cent., it is only reasonable to suppose that the same result would be obtained by the use of a much lower percentage of acid.

From these experiments, which must be regarded as purely of a preliminary nature, it is quite impossible to attempt to estimate the cost, and until the experiment has been tried in the field, on a comparatively large area, I would prefer not to express an opinion on this point.

Mr. F. B. Guthrie, Chemist, Department of Agriculture, on seeing the photographs of this experiment, sent to Moree for some alkaline soil, in order to ascertain, by experiment, the smallest quantity of nitric acid necessary to correct the poisonous properties of the alkali.

The Moree soil, when wet, is naturally a very sticky clay, and in a comparatively short time, under the influence of the alkali, "puddles" to such an extent as to render percolation practically out of the question. The soil used for the following experiment was specially selected from an old drain or channel which had been alternately saturated with bore-water, and dry, for the past nine years. It was very hard and tough when dry, and in order to bring it into something like a suitable condition or tilth, it was necessary to use a hammer to pulverise the clods. It was strongly alkaline, and contained sufficient carbonates and chlorides to prevent the proper growth of cereals.

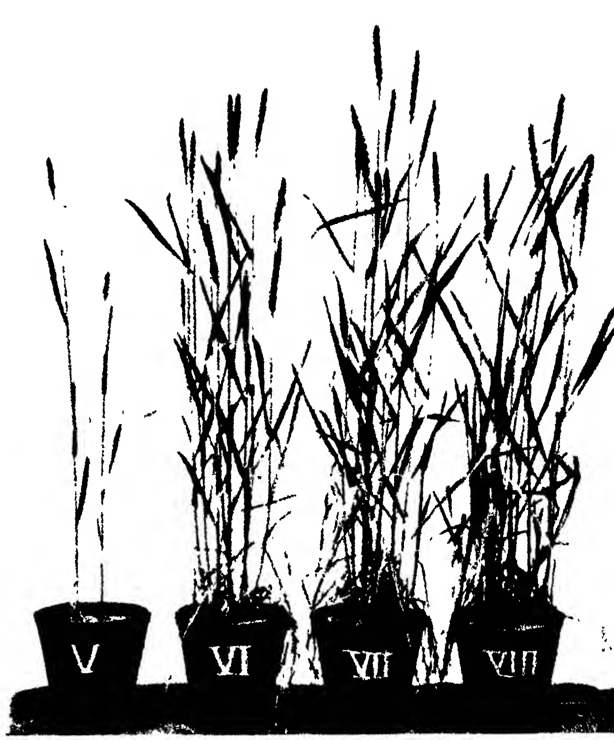

Fig. 2.

The pots, nine in number, were sown with wheat on June 13th, 1907; germination was excellent. *Four plants* only were allowed to grow in each pot. No. 1 contained the untreated alkaline soil as obtained, No. 2 was treated with ·002 per cent. nitric acid, No. 3 ·004 per cent., No. 4 ·008 per cent., and so on up to No. 8; No. 9 received ·25 per cent. nitric acid.

The illustration, from a photograph (Fig. 3), represents four of the pots on September 13th, 1907, and was taken in order to record the date on which the benefit of the treatment became clear. The plants in No. 1 made very little progress after that date, and practically remained stationary; all the

plants in the treated pots, from that date, grew in a startling manner. No. 2 contained twelve ears 3½ inches long, which was a remarkably good crop, when the past history of the soil is taken into consideration.

On October 14th, 1907, all the plants in the treated soil looked remarkably well, the ears of wheat varying in size and number according to the quantity of acid added to the soil. The ears of Nos. 6, 7, 8, and 9, were from 5 to 6 inches long; No. 9 contained forty ears—that is, ten ears from each grain of wheat sown.

The experiment was conducted in a vegetable garden connected with the Botanic Gardens, Sydney. On October 15th, 1907, a cow managed to find

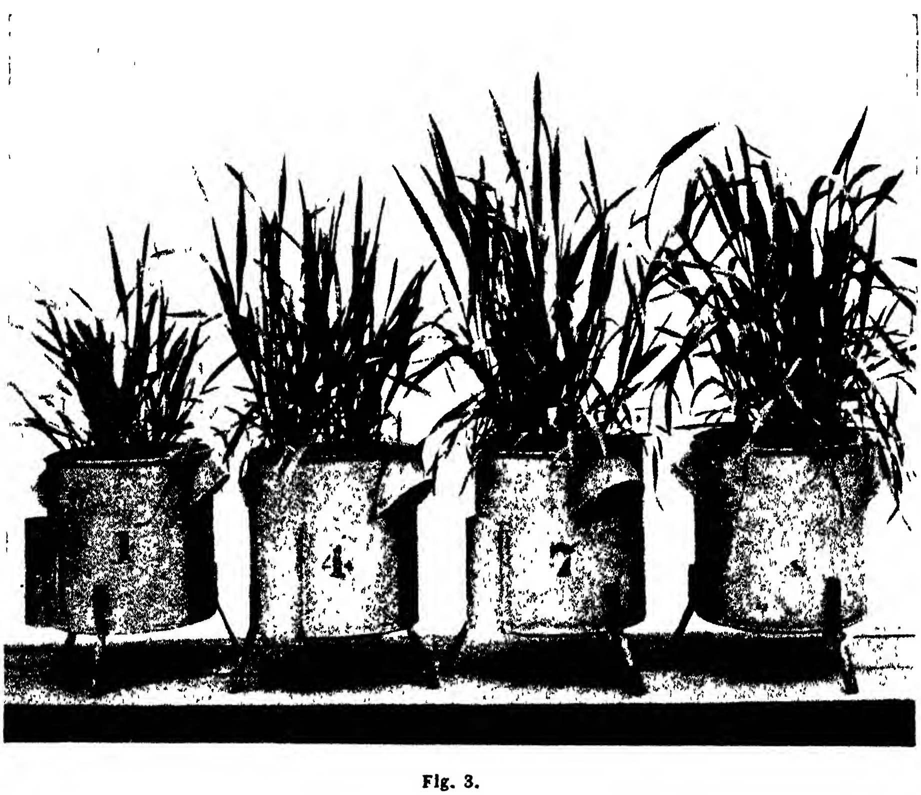

Fig. 3.

her way into that garden, and completely destroyed the experiment by eating the wheat. This was a great disappointment, which was intensified by the fact that the cow walked over and did not touch the cabbages, carrots, parsnips, lettuce, &c., which were growing in the garden.

It was, however, a very agreeable surprise to learn that the toxic properties of the alkali were corrected by such a small amount (·002 per cent.) of nitric acid. To treat an acre 6 inches deep with that percentage, the nitric acid would cost, if produced by modern methods, about 2s. 6d. per acre.

There is another very important use for nitric acid in connection with agriculture. For many years the application of sulphuric acid to rock

phosphates, for the manufacture of superphosphates, has been successfully practised, and the enormous influence which the introduction of superphosphate has had on the development of agriculture may be gathered from the quantity now annually employed by farmers. The annual manufacture of superphosphates in the world is about 6,000,000 tons.

As regards agricultural needs, it is evident that nitrate of lime, closely related as it is to nitrate of soda, has before it almost unlimited prospects, which are daily increasing. It is already well known that all nitrates of alkalies or of lime are as good manure as nitrate of soda.

It occurred to me that rock phosphates treated with nitric acid—instead of sulphuric acid—would produce nitrate of lime and water-soluble phosphoric acid, or nitrated calcium superphosphate.

In order to test in a practical manner the manurial value of superphosphate manufactured by each acid, some samples were prepared, the procedure being otherwise similar to that usual in the manufacture of superphosphate.

Some strongly alkaline soil from Moree was procured for the experiment. Fig. 4 illustrates the result, and shows clearly the superiority of the nitrated phosphates. Pot No. 9, unmanured soil; No. 10, manured with 5 grammes nitrated superphosphate; No. 11, manured with 5 grammes ordinary superphosphate. The pots were sown on June 8th, 1907, with four grains of wheat in each pot: germination was excellent.

Only two plants were allowed to mature in each case. The foliage of No. 9 was more yellow than green; No. 10 was a rich dark-green, and very vigorous; No. 11 was not a healthy green. In view of the extraordinary results of this experiment, it is only reasonable to assume that the nitric nitrogen corrects the toxic properties of the alkali, and restores the soil

Fig. 4.

to a high state of fertility. Nitrated calcium superphosphate should be of immense value, not only as a fertiliser for ordinary soils, but also in conjunction with our artesian irrigation with alkaline waters. The expense of packing and transport would not be higher than for ordinary superphosphate, and it would be particularly applicable to that portion of the artesian area where the pressure of the bore is not sufficient to produce nitric acid.

The mechanical power derivable from the pressure given in the outflow from artesian wells (some of them give a pressure so high as 150 lb. per square inch) could probably be turned to account in producing, on the spot, electro-chemical nitric acid from the atmosphere, a process which is now being carried out in Europe at a cost of £8 3s. 6d. per ton. This process for converting atmospheric nitrogen into nitric acid offers some novel features which render it particularly applicable to our unique conditions, the high pressure bores providing the power to produce from the atmosphere an antidote for their own toxicity, and thereby enormously increasing the fertility of the soil, and rendering us independent of a precarious rainfall.

The workers of one process state that they obtained a maximum output of 440 kilos (970 lb.) nitric acid per kilowatt year, when using a current of 0·05 ampère of 6,000 to 10,000 periods per second, at 50,000 volts, each arc absorbing 2·5 kilowatts. So that 2·5 kilowatts (about 3·4 h.p.) produced 1·1 ton of nitric acid per year.

A plant such as that mentioned could be duplicated according to the power available. There would not be any expensive transport, or packing of the acid, and it would be quite unnecessary to concentrate it for our purpose, which would mean a considerable reduction in the cost of the plant and working expenses. As the cost of raw material and power is nothing—an occurrence unique in the industrial world—it is simply a question of plant, working expenses, and intelligent supervision, and the enormous advantage of this process is apparent when working on such a large area.

In connection with the question of power derivable from artesian bores, Professor Mason writes:—" It would be difficult to find an artesian field more deserving of study, or more interesting to the investigator, than the one underlying the south-eastern corner of the United States, and which is tapped by the wells of northern Florida,—notably that of the Ponce de Leon at St. Augustine.

" The pressure was found to be 17 lb. to the inch, and the flow 10,000,000 of gallons in twenty-four hours. A turbine wheel fed by this flow maintained 120 incandescent lights at 16 candle-power, proving that the well was capable of supplying a force equal to 15 horse-power.

" Concerning the maintenance of the supply, we are possessed of information upon which to form a judgment. There are now in the town of St. Augustine and its immediate vicinity, in the neighbourhood of fifty artesian wells, varying in diameter from 2 to 12 inches, and exactly the same force exists to-day as when the first well was driven—*about ten years ago.* Another ground for believing that the supply of water is so abundant that it will

Photo. by E. F. Pittman, Esq.] [Government Geologist.

Tenandra Bore.

prove equal to any possible draught upon it by artesian wells lies in the unvarying pressure indicated by the very sensitive gauge of the electrical apparatus operated by the 12-inch well, surrounded as it is by wells on all sides being used in constantly varying quantities.

"Again, the increase in the diameter of the wells has been attended by more than a proportionate flow.

"While the dynamo was being operated by the 12-inch well a 6-inch well in its vicinity was turned on and off suddenly to test the steadiness of the force, but the closest observation did not detect the slightest trembling of the gauge."

Mr. Gibbons Cox, C.E., has dealt with this question in his book on "Irrigation and Land Drainage." He says: "The value of artesian water for irrigation purposes does not by any means exhaust the benefits derivable from the bores. Over the artesian areas of New South Wales and Queensland alone, amounting to 528,000 square miles, it is admissible to predict a great increase in the number of bores and a much larger outflow of water. As the natural rainfall is thus augmented by an increased water supply, settlement will proportionately increase, and with it a greater demand for labour-saving appliances to meet the various requirements of station and farm. In New South Wales and Queensland, for instance, there are 897 artesian bores running night and day, and, according to careful scientific calculations of the capacity of absorption of the average rainfall by the water-bearing rocks, they may be increased, as heretofore shown, forty-fold. The bores are all running under well-known laws that govern the movement and pressure of water. That pressure may be utilised in the simplest, most economical, and effective manner for work now done by the more costly and cumbersome modes of steam and horse power.

"These bore pressures are exceptionally great, and are equivalent to those very high heads of falling water—a source of pressure, as applied to turbines or water-motors, much in request of late in Europe and America for working ordinary machinery, and for the generation of electricity for lighting, for locomotive, and for manufacturing purposes.

"The use of water for the purposes of power dates back to the early centuries, and, even with the crude and primitive means then available, was made to subserve many useful purposes. It is, however, only within a comparatively short time that it has come to be recognised as the most practicable and potent of all the elemental forces, destined, in the near future, to do a large part in the world's work. The practice, which has so long prevailed, of appropriating only the larger streams, with low heads, allowing the higher lands to go to waste, is attended with so many difficulties and such expense, as to make a power so obtained often of questionable expediency. The old style of huge water-wheels has had its day. The modern turbine offers so many advantages for the general utilisation of all these sources of energy, that streams or waterways favourably situated for power purposes are now being eagerly sought for and appropriated. By its

Gil Gil Bore, Moree District.

use the entire force, or pressure, from artesian flows obtainable can be made available for all industrial purposes, with a greatly reduced cost, wider range of application, and fuller adaptation to varying requirements, than has before been realised. Nothing in a mechanical way has so signally and quickly proved its own usefulness, as well as its right to the first place in hydraulic-power appliances. Every stream or waterfall, and every bore outflow, is a mine of energy that, by means of this most simple appliance, can be converted directly into useful effect, with almost entire absence of machinery, and made available for any desired purpose, with a high degree of efficiency and comparatively small outlay.

Photo. by E. F. Pittman, Esq.] [Government Geologist.

Yarrawin Bore.

"The following bore pressures (which may be taken as representative ones) are from the New South Wales Government Report (1905), the other calculations being made by myself. It will be seen that bore pressures are of a very high value, as shown by the equivalent pressures from the high heads of falling water:—

	Pressure, lb. per sq. inch.	Equivalent Head, in feet of falling water.	Effective horse-power, per Pelton wheel, 2 feet diameter.
Belalie ...	187 ...	430 ...	67
Enngonia ...	165 ...	380 ...	56
Gil Gil ...	101 ...	230 ...	27
Pilliga ...	109 ...	250 ...	30
Tooloora ...	126 ...	290 ...	37
Careunga ...	120 ...	280 ...	35
Oreel ...	190 ...	440 ...	69

"It will be seen from the above table that there are inconsistencies in the pressure, as there are in the flows from artesian bores. It is generally, but erroneously, thought that the greater the pressure the higher the water rises above the surface, and that so in proportion is the flow greater. This is not the case. The discharge depends upon three factors: (1) the pressure under which the flow takes place; (2) the depth, diameter, and conditions of the bore itself; and (3) the nature and character of the stratum in which the flow is obtained. The ascertaining of (1) is an easy matter; (2) is, of course, known in the sinking of the bore; but (3) cannot be directly known. For instance, the flow from a thick seam of low porosity might be equivalent to a thinner seam of greater porosity. A bore with a very low flow—say, 30,000 gallons per diem—when closed might indicate a pressure of 150 lb. to the square inch, and, owing to the low porosity of the water-bearing stratum, which must certainly control the volume discharged, might take considerable time to reach this pressure. Another bore might have a much greater flow—say, 1,000,000 gallons—but, owing to the high porosity of the stratum, and a constantly free flow when closed, show a pressure of only 50 lb. to the square inch. Take, for example, two bores of equal diameter and pressure, but with different thicknesses of water-bearing stratum, of equal porosity, it is evident that the bore which penetrates to the thicker stratum must have the greater discharge. With variations, subject to conditions, there is a workable pressure from all flowing bores.

"Where power is to be derived from the higher pressure of artesian bores, or an extremely high fall, the use of the ordinary impulse and reaction turbine is rendered impossible—the one because of the enormous stresses which would be set up in the machinery; the other because of the prohibitively high speed which would be developed. With such bore pressure, or falls, an engine of the simplest construction is desirable, and one in which a reasonably high speed is obtained without undue strain on the working parts. Such a form of engine is found in what is known as the Pelton wheel, if this be intelligently designed. The engine consists essentially of a stout wheel, upon the periphery of which a number of specially shaped buckets, or vanes, are secured. The wheel is rotated by the impulse of the rapidly moving jets, working tangentially against the lowermost vanes, and the power developed is conveyed through the shaft. The power is regulated by a sliding valve, or sluice, behind the nozzle. The action of the vane, or bucket, on the wheel is to divide the jet into two equal parts, each of which glides over the curved surface of the vane, and is deflected backward until it is discharged from the wheel with practically no velocity.

"In falling water, the water in a state of pressure from gravity, is led through nozzles into the vanes of the wheel. In artesian flows, the water is likewise led through nozzles into the vanes—also in a state of pressure due to gravity of the body of water held in the water-bearing rocks lying above the level of the bore site; so that, in practical effect, there is no difference between the two sources of supply, the final application being in both cases the same.

"This form of water-motor is specially adapted to utilise the pressure power from artesian bores, because the power can be applied *direct from the bore itself*, whereas falling water has in most cases to be led from its head source to the wheel, *a considerable loss of power accruing from frictional resistance* inside the piping.

"Taking New South Wales and Queensland combined, there are as stated, 897 bores now running in these two States. Twenty-eight of them—officially measured—give an average pressure of 82 lb. per square inch (equal to 190-feet head), at which rate the bores now running would give, in pressure applied to a 3 feet Pelton wheel, 39,468 horse-power. That power is now mostly unused, unheeded, running to waste, but it appeals, as does the artesian water itself, with Nature's mute eloquence, for perfect utilisation.

"The power derivable from artesian flows in Australia is both ubiquitous and unique. It is cropping up in out-of-the way places where steam power is not payable, and ordinary falling-water power is out of the question. The power is direct, and one of the most economical conceivable. To meet the numberless mechanical operations of the station or farm, and for electric lighting—a small dynamo and wheel combined being procurable—it is most desirable. The power being free from working expenses in its production, and the cost being extremely moderate. should ensure its extensive use in the future."

Sir William Owen, in his report on the administration of the Lands Department. says:—

"The artesian basin in this State is estimated to cover 83,000 square miles, and to extend over almost the whole of the north of the State, extending south as far as Dubbo. To the westward it covers a large part of South Australia, and to the north it runs through a great extent of Queensland up to Cape York. This enormous supply of water ought to, and will, I have no doubt, be in time available, not only for watering the flocks and herds, but also for supplying fodder, for agriculture and fruits; but as yet we have done very little to make it really effective for any purpose except the first.

"At Riverside, in the San Bernardino Valley, in California, many of the wells are within 15 feet of each other, and have *been flowing for sixteen years.* In this State, I believe, none are nearer than about 5 miles, and very few so close.

"In the San Louis Valley alone, containing an area of about 8,000 square miles, there are 3,700 artesian wells. In this State, where the artesian basin comprises 83,000 square miles, there are only about 372.

"In this State little has been done beyond sinking the bores and letting the water run to waste, except to provide sheep and cattle with water to drink.

"Mr. Boultbee has made a full and most interesting report on artesian boring and irrigation in America, which was laid upon the table of the House by the Honorable E. W. O'Sullivan, on the 25th November, 1902. This report contains a detailed account of the great and successful efforts which

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REPRODUCED FROM

"PROBLEMS OF THE ARTESIAN WATER SUPPLY OF AUSTRALIA,"

BY E. F. PITTMAN, A.R.S.M.

have been made in America to utilise the artesian water in the arid parts of the Western States, and ought to be carefully studied if the 83,000 square miles of the artesian basin in this State are to be properly utilised.

"In America, great stress is laid on the analysis of the soil, not merely of the surface, but to a depth of 4 or 5 feet, and in one respect it appears that we have a great advantage over the Western States of America, in that the land in this State is almost free from the presence of alkalies, whereas in America the land is to a considerable extent charged with alkalies in its natural state.

"I think the Government ought to have the water in each bore periodically tested to ascertain whether the flow increases or diminishes, and whether it is affected by drought or flood, or by the proximity of other bores, and whether the alkaline constituents in the water increase or diminish with the continued flow of the water.

"In America, elaborate tests have been made to determine to what extent various cereals, fodder plants, and fruit-trees are tolerant of alkalies; and I think a very useful experiment might be made of a Government farm in some arid district watered by bore-water in order to see what cereals, fodder plants, &c., do best when so watered, and to determine scientifically what the effect of bore-water in agriculture is, and how far the injurious effect of the alkalies can be counteracted.

"Such a farm ought to set at rest many of the vexed questions as to the effects of bore-water on agriculture, and would be an object lesson to settlers as to how bore-water ought to be applied, in what quantities and times, and to what soils, and the kinds of cereals, fodder plants, &c., ought to be grown.

"So far as the evidence before me goes, the soil in the arid districts is unquestionably rich when supplied with sufficient water; indeed, Professor Hilgard, the great authority on the subject in America, lays it down that—'Arid countries are always rich countries when irrigated'—principally on the ground that—'Where the rainfall is insufficient to carry the soluble compounds formed in the weathering of the soil mass into the country drainage, these compounds must of necessity remain and accumulate in the soil.'"

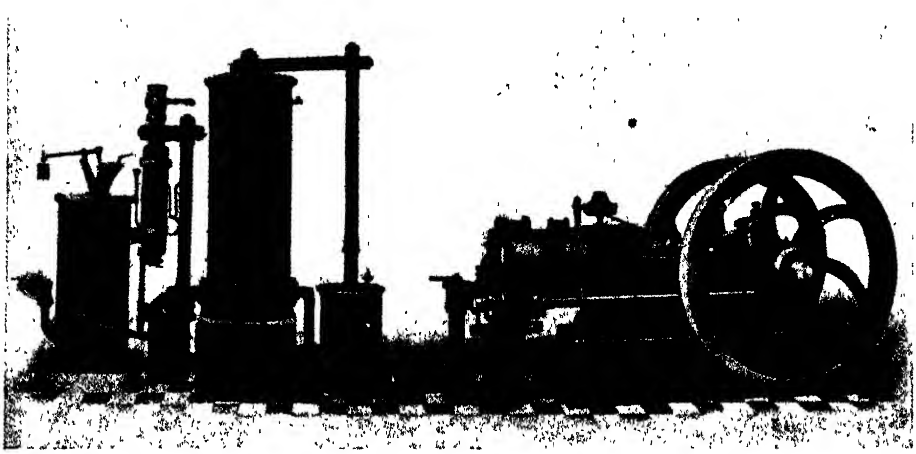
A glance at Mr. Pittman's Map of Australia, which shows the extent, as far as known, of the great artesian basin, impresses one with the importance of producing the nitric acid on the spot, and as the power derivable from some of the bores would not be sufficient for that purpose, the suction gas plant could be economically and successfully applied.

Suction gas engines are in general use in Australia, and well known as "the cheapest power on earth." With charcoal or coke at £1 per ton, a 28-B.H.P. plant can be run for a day of nine hours, at a cost of 1s. 6d. for fuel.

Mr. F. Howles, M.Sc., has dealt at considerable length with this question in a paper read before the Society of Chemical Industry. The following has been copied from his paper:—"With regard to resources nearer at hand,

and means available for producing electrical energy in our own country, it will be generally conceded that steam power is out of the question for the problem in hand, although it is estimated that, with the best modern appliances, 1 kilowatt year of 8,760 hours can be produced in south-east Lancashire for £6. The gas engine, however, offers more hope of success, and it will be interesting to consider the cost of production by this motor when run on gaseous fuel obtained from various sources. The gas obtained by the distillation of coal in closed retorts does not come within the scope of this inquiry, as the only suitable sources of supply would be the modern coke ovens, and the gas in such cases is entirely consumed in carrying out the operations of the works, partly in distilling the coal, tar, &c., and partly in raising steam for power purposes, and also for the rectification of the low-boiling fractions of the tar.

"We must, therefore, turn to producer gas as a source of supply. Even the smaller units, of which so many are now in the market, show great economy over steam engines in the production of power. I may cite a case of such a unit, now running in London, and using coke as fuel, with which



Suction Gas Plant.

a four weeks' test was carried out. The results showed that a kilowatt year could be produced for £6 2s.; this sum includes all charges. On this basis, 1 ton of nitric acid would cost £10 6s. 8d. With the larger plants, however, and taking the Mond producer as the best representative type, a very much greater economy is shown. Using the figures given by Guye, in his paper, read before the London Section of this Society, in May, 1906, we find that, with fuel at 7s. per ton, and reckoning £14 as the cost of the outfit, the kilowatt year costs £3 13s. 6d., approximately. Under these circumstances, the energy-cost per ton of nitric acid, would amount to £6 3s.

"At the pit mouth, coal suitable for Mond producers could be obtained at 5s. per ton, thus decreasing the cost somewhat as regards fuel, but not in the same ratio as the difference in the cost of the fuels, since the lower priced fuel would contain more ash.

"The Mond producers possess the further advantage, that about 90 lb. of ammonium sulphate are obtained per ton of coal consumed. This opens up the possibility of preparing ammonium nitrate and nitrite as a subsidiary industry.

"There is still a source of power in this country which is probably cheaper than any we have considered this evening. I allude to the enormous volumes of blast-furnace gases which are regularly produced in the manufacture of iron, and a very large proportion of which, in this country, are just as regularly wasted. The first to apply these gases to the production of power was B. H. Thwaite, who, in May, 1895, was granted a patent for the special methods he employed in effecting a purification of the gases, and using such purified gases in the thermo-dynamic motors. A small plant was put down at the Glasgow Iron and Steel Co.'s furnaces at Wishaw, and has since run continuously, supplying electric light for the use of the works."

Since that date enormous advances have been made on the Continent in the utilisation of blast-furnace gases. The matter has long passed the experimental stage, and success is assured. In Germany alone, about 340 blast-furnace gas engines, with a total capacity of 200,000 h.-p., were in use in 1902. Since that date, another 100,000 h.-p. has been installed, representing 100 engines, each of over 1,000 h.-p. The Nürnberg Engine Co. are now constructing engines up to 4,000 h.-p. Other well-known makers of blast-furnace gas engines are Deutz, Körting, Berlin-Anhalt Engines, Daner, and the Corkerill. I am also informed that the British Westinghouse Co. are contemplating the construction of engines of more than 1,000 h.-p. The very finely-divided dust remaining in the gases after scrubbing, and amounting to about 0·17 per cent., does not appear to have any deleterious effect on the working parts of the engines. Very favourable reports as to the condition of the cylinders after the engines had been running for a period of two years have been received. After providing for all the power necessary for the operation of the works, such as heating the blast, blowing, hoisting, &c., there remains a surplus which, when gas engines are used, is estimated at from 500 to 1,000 h.-p. hours per ton of iron made.

Now, in 1906, 9,592,737 tons of pig iron were produced in Great Britain. For the sake of simplifying the calculations we will assume a yearly production of 10,000,000 tons, or 1,250 tons per hour, and taking an average surplus of 750 h.-p. hours per ton, the total available surplus will amount to $750 \times 1{,}250 = 937{,}500$ h.-p., or nearly 1,000,000 h.-p.

In Germany, about the same amount of surplus power would be available; in France, about one-third of this amount; thus making a total for Europe of at least 2,300,000 h.-p.

The shipments of nitre to Europe in 1906, as shown by statistics, were 1,335,689 tons. Assuming a production of 1 ton of sodium nitrate per 1·6 h.-p. year, 2,137,102 h.-p. would be necessary to produce the quantity of nitrate above indicated. Thus the surplus power from the blast-furnaces of Europe would be more than sufficient to supply the electrical energy required for the manufacture of nitrates, at the present rate of consumption, in this continent.

Our own furnaces could supply energy equivalent to 585,937 tons of nitrate, or 472,404 tons in excess of our requirements.

The output of iron from the American furnaces is almost equal to that obtained from those of Europe; and if the surplus power were used for the production of nitre, the world's output of this commodity could be trebled.

Allowing a capital outlay of £10 per kilowatt for the buildings and power outfit, and for—

	£	s.	d.
Interest and depreciation, 10 per cent. ...	1	0	0
Upkeep	0	6	8
Labour	0	6	8
Total per kilowatt year	£1	13	4

(Exclusive of blast-furnace gases.)

It may be interesting to note the relative costs of power derived from the various sources for the production of 1 ton of anhydrous nitric acid, to which end I have drawn up the following table:—

Source	Cost per kilowatt year.	Cost per ton, anhydrous nitric acid.
	£ s. d.	£ s. d.
Water	4 0 0 (average).	6 13 4
Steam	6 0 0 (S.E. Lancs.).	10 0 0
Mond gas	3 13 6	6 3 0
Blast furnaces' gases ..	1 13 4 (excl. cost of gas).	2 15 6

I do not suggest that no other use can be found for this enormous total of surplus power than that indicated above. It is highly probable that in the near future a large proportion will be employed in the iron and steel industry, as is the case in Germany to day. Nevertheless, a large surplus will remain, which will be available as a source of cheap energy for the electro-chemical industries, cheaper than that obtainable from any other source in this country, and, perhaps, than that derived from most waterfalls, the economy of which is, I think, in many cases, over-estimated.

Almost the whole of the world's supply of nitrate of soda is obtained from Chili, and recent calculations indicate the year 1923 as the date when these beds will be exhausted. This date will be still nearer if we accept the statement made by Sir William Crookes.

Taking into consideration the fact that the electro-thermic combustion of atmospheric nitrogen, as a means of producing nitric acid cheaply, is thoroughly established, the carbonate of soda in our artesian waters, which at present is a substance poisonous to vegetation, promises to be in the near future ***an asset of incalculable value to Australia***, and a great lasting triumph of man over natural productions.

The whole scheme is fascinating and sound. The geologist, chemist, physicist, electrician, engineer, and agriculturist each play an important, well-established part, and the capitalist should not be slow to recognise the advantages of an enormously increased yield. To get in one season, with one tillage, sowing, and harvesting operation, what under ordinary circumstances would take five or six years, and to get it practically for nothing, without risk, is an occurrence extremely rare. The results so far achieved are phenomenal, and the process may fairly be regarded as worthy of being fully investigated in the field.

NOTE.—The Minister, being deeply impressed with the potentialities of experimental work on the lines herein indicated, has approved of a start being made at once on soil at the Moree Experiment Farm, which has been irrigated for a number of years with artesian water, of which an analysis is given in this paper.

An area of 2 to 3 acres is being sown with one variety of wheat, one part is to be left untreated, and others treated with nitric acid at the rate of varying quantities per acre.

If the results of the experiment, which will be carried on for several years, after still further irrigation with this artesian water, corroborate the pot experiments herein described by Mr. Symmonds, a distinct addition to our knowledge of this important subject will have been made.

The next step must be to experiment in the direction of making cheap nitric acid, for the present price in Sydney (£32 per ton), with the cost of transport to our artesian bores added, makes the use of it on large areas practically impossible. If, however, the power generated by the ascending column of artesian water in an average bore can be harnessed and used to develop electric currents, which will oxidise the inert nitrogen of the air into nitric acid, the use of this agent to neutralise the toxic effects of the carbonate of soda, and make it into a valuable fertiliser, will be brought within the realm of practical agriculture.

For this second stage of the experiment it will be necessary to get from Great Britain the machinery needed to generate the nitric acid by the operation of a Pelton wheel driven by the force of the artesian bore, and Parliament will be asked to make the requisite appropriation. Meanwhile the other problem of making cheap acid by the agency of the blast-furnace gases now going to waste at Lithgow and elsewhere, is one well worthy of the investigation of our engineers.—H.C.L.A.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from page 536.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVIII—*continued.*

Trees other than Conifers and Palms:

Oaks.

The European and Asia Minor Oaks.

1. *Q. ægilops*, L. The "Valonia Oak." Fig. by Kotschy as *Q. græca*, Kotschy-*Q. ægilops* var. *graeca*.

Q. vallonea, Kotschy, and *Q. macrolepis*, Kotschy, also figured in the same work, are closely allied forms.

I would invite attention to an illustrated and lengthy article by me in this *Gazette* for July 1899, which it is unnecessary to reproduce. It is entitled "The Valonia Oak; a tree of the greatest importance to tanners." Its acorn cups are the part utilized, and are termed Valonia. It is a beautiful tree, apart from its economic value.

It is evergreen and will flourish in moist places in the cooler parts of the State. I have no hesitation in recommending it as one of the most valuable of all oaks.

Native of South Europe and Syria.

2. *Q. cerris*, L. The "Moss-cupped"—or "Turkey Oak." The former name is given because of the mossy-like processes of the acorn cups.

A deciduous and beautiful species. It is a large, shady tree and does admirably in the Botanic Gardens, Sydney, in a rather dry situation, but it will stand much cold and is specially recommended for trial in the colder districts.

It furnishes a timber much in favour with wheelwrights, cabinet-makers, turners, coopers, &c.

South Europe and South-Western Asia.

L 30. See photo.

3. *Q coccifera*, L. "Kermes Oak." Fig. by Kotschy.

This is an oak which yields a valuable tan-bark and also a red dye (Kermes) from insects, allied to Cochineal insects, which infest it. "The name Kermes is derived from the Arabic word for worm, and is the parent of the French *cramoisi*, and the English crimson" (*Treasury of Botany*).

This is recommended by Mueller, and I insert it because he does so; but the introduction of trees and of insects to feed upon them raises the question

Quercus cerris, L.
Botanic Gardens, Sydney.

of two kinds of acclimatisation (see also *Q. lusitanica*, var. *infectoria*), and it may be that insects introduced into Australia may not be as amenable to discipline as in their native countries.

It is a native of the Mediterranean Region.

4. *Q. Ilex*, L. The "Holm or Holly Oak." Fig. Kotschy.

This is an evergreen species and, like the Live Oak (*Q. virginiana*) of the United States, it is an admirable tree for many parts of New South Wales, especially near the coast. It is especially worthy of attention.

The bark is used by tanners, and the wood employed for various purposes. The acorns are eaten in France.

It is a native of South Europe, extending also to Algeria and the Himalayas, which it ascends up to about 10,000 feet.

L 7. See photo.

Quercus Ilex, L. var.
Botanic Gardens, Sydney.

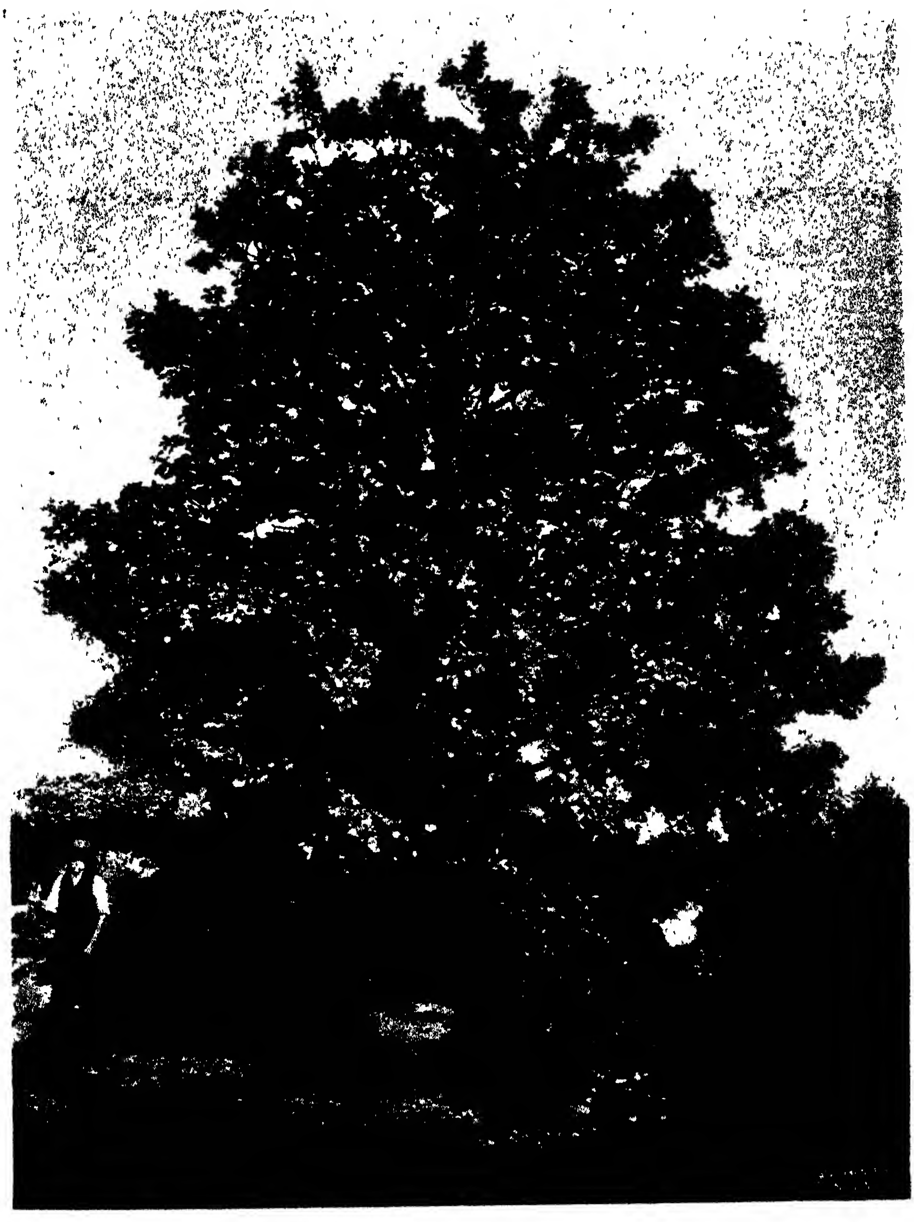
The following, *Q. Ballota*, Desfontaines, is by some considered a variety of *Q. Ilex*, but by other botanists as specifically distinct, being also of a more delicate constitution. The Ballota-acorns form really a considerable share of agreeable table fruits in the countries of their nativity. (Dr. R. Prior.)

It is a native of Spain and Portugal.

5. *Q. lusitanica*, Lam. The "Gall-nut Oak." Fig. in Hooker's *Icones Plantarum*, t. 562.

Q. infectoria, Olivier, is by most authors considered to be a variety of the above and is a small tree which yields the round oak-galls (the product of the punctures of a hymenopterous insect) which are used, or at all events were

employed formerly, in dyeing and ink making. Now they are used for the preparation of tannic and gallic acids and in medicine.



Quercus lusitanica, Lam.
Botanic Gardens, Sydney.

The Gall-nut Oak is a native of the Mediterranean Region. It can be highly recommended for the coast districts. With us it forms a small tree of 20 feet so far, but it is in a very exposed and unsuitable situation. The fact

Quercus lusitanica, Lam.
State Nursery, Campbelltown.

that it flourishes at all in its present situation shows how hardy it is. L 26 a. See photos of *Q. lusitanica.* The Campbelltown specimen is six years old.

Quercus pseudo-suber, Santi.
Botanic Gardens, Sydney.

6. *Q. pseudo-suber*, Santi. South Europe. The "False Cork Oak." Fig. Kotschy. It yields a cork inferior to that of *Q. Suber.*

The remarks made under *Q. lusitanica* apply to the Botanic Gardens tree. It has not fruited with us so far.

L 26 c. See photo.

7. *Q. Robur*, L., is the British Oak. It extends throughout the greater part of Europe and Western Asia. It includes two forms, *Q. pedunculata* and *Q. sessiliflora*, which, however, run into each other.

These forms are figured in Kotschy and other works.

Q. pedunculata is the variety which furnished most of the timber used in Britain for ship-building, staves, &c.

Quercus Robur, L., var. (pedunculata).
Government Domain.

Following are instructions in regard to the propagation of the British Oak issued by Mr. Hutchins, late Chief Conservator of Forests, Cape Town, for use in South Africa.

"Care is necessary in collecting acorns for seed purposes. Rejecting the first that fall, seed acorns should be picked off the ground as soon as possible, mixed with sandy soil and stored in a dry place till spring, or else sown at once. The latter plan is the best. Make a nursery ready, by digging and (in almost every case) manuring a piece of ground. Lay out drills about 10 inches apart and sow the acorns close (about touching), in single lines. Weed between the lines by hand or with the American single-wheel cultivator. A simple method, and one that often succeeds quite as well, is to sow close and broadcast in small beds and trust to the young oaks keeping down the weeds. In

either case transplant out into lines during the first winter after sowing, spacing the young oaks 5 inches in the lines and setting the lines 12 inches apart. They may stand thus for three or four years according to size of transplant required. Specially large and strong transplants are made by transplanting once or twice in the nursery and spacing the trees then 8 in. x 18 in. It takes five or six years to produce a full grown oak transplant 7 or 8 feet high. Transplants that are obtained by digging out young trees from existing woods are, as may be observed any day, of doubtful success. And the pollard tree produced by this method is never a sound tree.

"Oaks should be planted during July or August as slender saplings 5 or 6 feet high, with a good ball of fibrous roots. They should, for this purpose, have been twice transplanted in the nursery. Any side branches that exist in the nursery tree should be taken off with a smooth cut close to the stem. When the planted tree shoots, rub off all side sprouts and allow only two or three branches at the crown of the tree during the first year. The second year is often the most trying for oak transplants, so that the tree's store of food material should be husbanded for that year by checking a too exuberant growth during the first year. If necessary, water during the first summer.

"The oak in Europe is scarcely ever planted pure. It is usually mixed with beech and more rarely horn-beam or pine.'

The Major Oak.

U 8 d; L 7, 8, 19, 29 b. See photo, also a photo of the Major Oak, the largest in Sherwood Forest, Nottinghamshire, England; it can hold sixteen persons in its hollow trunk.

8. *Q. Suber*, L. The "Cork Oak." Fig. Kotschy.

This is the tree whose furrowed bark yields the cork of commerce. I would invite attention to an illustrated article on this oak I wrote for the *Gazette* for February, 1902.

See also the article "Cork Oak" by Dr. J. D. Jones, in Bulletin No. 11, Department of Agriculture, U.S.A. (Division of Forestry.)

It is an evergreen tree and it is well adapted to our coastal districts. I do not see why we should not grow all the cork we require.

Quercus Suber, L.
Camden Park

South Europe and North Africa. Near the Opuntia beds, Garden Palace Grounds. See photo.

Quercus Suber, L.
Botanic Gardens, Sydney.

9. *Q. Toza*, Bosc. Fig. Kotschy.

South Europe. One of the handsomest oaks with beautiful pinnatifid foliage. It is one of the quickest in growth. Will live in sandy soil and emits suckers. It furnishes superior tanners' bark.

We have no experience of it in the Sydney Botanic Gardens.

(*To be continued.*)

Hawkesbury Agricultural College and Experiment Farm.

Feeding of Pigs.

[Continued from page 1090, November, 1906.]

H. W. POTTS.

IX.

Lucerne.

"Lucerne is destined to become a factor of the greatest importance in pig-feeding operations wherever that wonderful plant will grow."—Professor Henry.

Owing to its high protein contents lucerne is known to be one of the most suitable foods for giving vitality and strength to tendons, muscles, and nerves. It assists in developing the bony structure of all domestic animals, and in addition it produces lean meat.

It is a cheap and relishable fodder for pigs in all stages of their growth, more especially for sows during the period between service and farrowing; and for boars and young pigs when building up frame, prior to fattening.

It has long been recognised that whilst wheaten bran provides an excellent food for cows in milk, its effect on pigs is distinctly different, and its use as a food for them is contra-indicated.

The object of feeding bran is to provide protein in the dairy ration in a conveniently concentrated form. The best substitute is lucerne, as may be seen by the following analysis, in which the leading food constituents closely agree:—

Digestible nutrients in 100 lb. of bran and lucerne hay.

	Protein.	Carbo-hydrates.	Fat.
	lb.	lb.	lb.
Wheat Bran	12·2	39·2	2·7
Lucerne Hay	11·0	39·6	1·2

It is also known that lucerne, either as pasture or hay, is palatable and readily assimilated or converted into blood, otherwise digestible.

In studying the composition of the plant it is found that the leaves are 40 per cent. richer in protein, 30 per cent. in fat, and 15 per cent. in mineral matter than other portions. When feeding, the aim is to design a fairly narrow ration, ranging from 1 : 4·5 to 1 : 6. The former is more suitable for young growing pigs, and it may be gradually widened to 1 : 6 for pigs from 5 to 6 months old.

In arranging a ration the protein content is of equal importance with that of cost, but both must receive consideration. The general principle applies that foods containing a high percentage of protein are costly, whereas the wider rations containing more carbo-hydrates are cheaper.

A narrow ration produces the quickest gain in weight, especially in young animals, hence the need for increasing the carbo-hydrates in the ration as the pigs grow older.

Experience bears out the scientific truth that protein increases the quantity of red meat. When pigs are fed on lucerne in sufficient quantity to provide a well-balanced ration, there is a greater distribution of lean throughout the flesh.

During the period of pregnancy sows require a class of food rich in protein to maintain the demand for tissue making, and developing the unborn pigs, each of which weighs from 2 lb. to 2½ lb. at birth.

As a rule our grasses are sufficiently rich, but it is always an advantage to give lucerne. The sows are in better condition for suckling, and the young more thrifty and sturdy at birth.

When denied food containing a proper quantity of protein, and fed too largely on maize or other carbonaceous foods, the sow becomes abnormally depraved in the desire for foods containing protein, and by no means infrequently satisfies this inordinate appetite by eating the sucklings just born.

Young pigs, after weaning, when fed on lucerne judiciously balanced with grain, have more lusty vital organs, stronger bone, and more blood.

Boars at the stud are always better for service with a diet including lucerne.

In all cases lucerne alone, either as hay, green fodder, or silage, is too narrow a ration, and hence should be balanced with maize, barley, rye, oats, potatoes, or other starchy foods.

Lucerne hay or green fodder is best fed from a rack, as pigs are so liable to injure and soil food of the kind fed on the floor of the sty.

The practice of depasturing lucerne is highly profitable. Pigs are very partial to it. Much depends on the nature of the stand as to quantity, but under average conditions 1 acre has been found ample to graze fifteen pigs, when supplemented with grain. A gain of 776 lb. of pork per acre was made in a test in Kansas on lucerne-grazing supplemented with maize.

In light sandy loams, such as we find in many parts of the Hawkesbury district, at the College and other parts of the State, direct grazing is not satisfactory, and the pigs have been known to destroy the stand in two seasons. In such cases it is better to mow, and feed through racks.

Where the land is a heavy or medium heavy loam, with the plants full grown, *i.e.*, at least three years old, then grazing may be conducted, with periods of rest to enable the plants to produce another growth, and before the crowns of the plants can be injured by too close grazing.

Feeding green lucerne will yield a greater quantity of pork per acre than clover or grasses, and at much less cost.

How to grow Lucerne.

Small areas of land can be profitably employed for pig-feeding as green fodder, hay, or grazing. It will be of interest to those engaged in pig-raising to briefly describe the chief points as a guide in its cultivation and management.

The plant grows best in deep, friable, loamy soils, containing lime, with porous well-drained deep subsoils. In this lucerne establishes itself rapidly, penetrates the subsoils to great depths, and eventually becomes one of the best drought-resistant plants we possess.

In all situations where there exists underground water, lucerne will send its roots down. Rich creek or river flats are best, provided there is no serious overflow. The long vigorous roots of the plant grow to great depths in search of plant food and moisture.

Instances are on record in Australia where splendid lucerne paddocks sown forty years ago are still giving six to eight heavy cuts per annum. The roots are found in a healthy state 30 feet below the surface.

This, of course, is where the plant is grown under ideal conditions. It is much shorter-lived on poorer soils and in dry districts. It can be grown more or less luxuriantly on a wide range of soils. It is simply surprising how vigorous the plant is, and how it survives the greatest hardships so long as the soils, however poor, are deep and naturally or artificially well drained.

No better instance of its drought-resisting capacity and hardy nature can be adduced than the case of 50 acres growing well at this College farm on low-grade soils, and with drought conditions during the past three years.

Lucerne is not influenced by altitude, so long as the soils are deep, warm, and well drained, and moisture is available.

On lands with stiff clay subsoils, and where water is likely to lodge around the roots more than forty-eight hours, the plant does not flourish.

Preparation of the Soil.

It must be remembered that lucerne is a gross feeder, and when once established will last a number of years, and, from a monetary point of view, will afford a greater return than any other fodder. The success of its growth to a great extent depends on the selection of the land and the care and intelligence bestowed on the preliminary preparation of the soil.

The land must be clean and free from weeds. To effect this, one or more crops should be taken off, not only to get rid of weeds, but to enable a proper system of fertilisation to be effected (also liming if needed).

Any of the following crops will be suitable:—Wheat, rye, maize, barley, or potatoes. The best crops are cowpeas, soy beans, clover, Canada field peas, or vetches, seeing they provide nitrogen to the soil as well as humus.

Where couch grass is growing, a crop of barley or wheat followed by one of cowpeas will be found necessary.

A summer fallow has the advantage of rendering the land free from weeds, as well as releasing plant food.

Where the soil requires enriching, farm-yard manure is useful. One objection to its application is the presence of weed seeds. This may be overcome by applying it to the cleansing crops, or using it only when well rotted.

Thorough cultivation is a paramount necessity in securing a strong, healthy, even, continuous growth. The richer and cleaner the land, the greater the assurance of a successful stand.

Summarising the leading points, we have to bear in mind those of good drainage, a deep porous subsoil, lime, manure, fertilisation by bacteria, moisture, cultivation, and warmth.

Soil inoculation has only of late years been discovered to be an important element in the preparation of land for lucerne. The land may possess all other essentials and yet be deficient in the bacteria or micro-organisms which provide centres of action in the warty excrescences or nodules found along the rootlets of the plant. These act as the medium through which nitrogen is transmitted from the atmosphere and made available as plant food at a minimum cost. Without this form of inoculation the plant fails to flourish, and this is often the cause of farmers' abortive efforts to establish lucerne.

Inoculation can be accomplished in a simple way, by carting five to thirty loads of soil from old clover or lucerne paddocks and spreading over each acre.

In order to correct acidity in the soil and to aid the plant in gathering atmospheric soil nitrogen, lime should be supplied at the rate of from half to 1 ton per acre. It is better to add the lime with the cleansing crop.

Where there is a deficiency in mineral elements, such as we find in light sandy soils, the following manure may be applied:—

No. 1.

Dried blood	300 lb.
Superphosphate	720 ,,
Sulphate of potash	200 ,,

and applied at the rate of 3½ cwt. per acre; or

No. 2.

Sulphate of ammonia	50 lb.
Superphosphate	300 ,,
Sulphate of potash	100 ,,

per acre.

Early in each spring a top dressing of either of the above mixtures will stimulate growth, if applied at the rate of 2 cwt. per acre, but omitting the dried blood in No. 1 and sulphate of ammonia in No. 2.

Where the subsoil is hard or set it will be necessary to loosen or stir it with a subsoiling plough to a depth of 12 or 14 inches, without bringing any of the soil to the surface. The roots are thereby enabled to readily penetrate the subsoils, and furthermore provision is made for storing moisture. This is especially needed in semi-arid areas. So much depends on keeping the young plant well supplied with moisture in its early stage of growth by capillary attraction.

The object is to work up a compact, mellow, moist subsoil.

The young plant is a weak feeder, and requires considerable attention in the early stages of germination and growth, and in this connection a well cultivated and thoroughly fine seed bed must be prepared to a depth of 4 or 5 inches by ploughing, harrowing, and rolling.

It is occasionally advised to sow a nurse crop with the seed, such as oats, barley, or wheat. In a warm climate this is not always found good practice, seeing all available moisture is wanted to effect complete germination in the lucerne seed. In ordering seed strict care should be observed in obtaining it bright, plump, clean, and free from weed seeds and dodder.

Tamworth seed has the best reputation.

Use 15 lb. to 20 lb. to the acre. Broadcasting is the most favoured method of sowing, while the wheel-barrow seeder is the handiest implement.

The seed should not be covered more than 2 inches with the harrows, and in a wet season 1 inch is enough on compact soil. If planted too deep the young shoots become choked and fail to reach the surface.

Where the soil is light or dry it will be necessary to roll, and cover the seed and compact the soil.

The best time to sow is late in February or March, when the soil is warm and just after the early autumn rains.

Cutting.

The first growth will be found associated with weeds, and these ought to be checked by early mowing. Frequent cutting is not recommended in the early stages, and the cutter-bar should be raised slightly in order not to cut too closely. Root growth is stimulated by leaf growth; the latter affords the stimulating constituents. When the plant is well established, frequent close cutting creates a more vigorous growth. It is also benefited by occasional cultivation with the disc harrow or lucerne cultivator. This loosens the soil surface, conserves moisture, aerates the soil, and checks the growth of weeds. The first cut invariably is so mixed with succulent herbage and weeds that it is impossible to convert it into hay. It may be consumed at once as green fodder, or converted into silage.

The proper time to cut each main crop is when one-tenth of the plants are in bloom. One week after the bloom appears, the indigestible portion of the plant increases, and its more nourishing constituents—protein and fat—decrease until the seed ripens. The yield is slightly greater at the time of blossom, but the quality of the hay is superior a few days earlier.

After full blossoming the lower leaves begin to fall.

Leaves are the most valuable portion of the plant, and it is the chief aim to cut, wilt, and dry the hay in such manner as to collect the plant whole, without losing any leaves.

It requires very careful handling and good judgment to convert it into well-cured and rich-coloured hay, perhaps more so than any other fodder.

The digestible nutrients in lucerne hay are easily dissolved and washed out by rains. It is best kept in big stacks under a sound roof.

The Incubator at Work.

A. L. WYNDHAM,
Wagga Experiment Farm.

THE *house or room* to run the machine in is the first consideration, not so much for the purpose of helping the incubator to keep the proper heat, but to have normal temperature to air the eggs in, 60° Fahr. being the best for results. Pure air, with ventilation from the level of the floor to the ceiling, if possible, light, freedom from harmful dampness, such as may result from the want of proper drainage or the use of an absorbent, such as sawdust, on the floor, and a cement or earth floor to provide against the machines being shaken are essential.

The machine.—No special make can be recommended. Experience alone can teach the beginner what incubator he will be most successful with.

The eggs should not be more than three weeks old, and be turned once daily whilst gathering. Do not wash them, if possible, as it destroys the mucous covering of the pores in the shell; if it is necessary, let it be done just before placing in the incubator. Keep them in some place with an even temperature. Avoid hatching brown and white eggs together. The brown on the shell is a coloured matter, which makes the mucous harder to dissolve; and if you have both sorts of eggs in the machine at once, there is a big chance of the white eggs needing artificial moisture, while the same will be harmful to the brown eggs. Run one batch of eggs right through; filling up the space caused by withdrawals of infertile eggs will not compensate for the loss and extra trouble caused. Grade the eggs for setting carefully, putting out all extra large or small shells with faults or lumps of lime on them. They should be stored while gathering, with the large end slightly elevated. Mark on one side, for convenience while incubating, with plain lead pencil. The matter from ink or indelible pencil may be absorbed into the egg. Avoid touching eggs at any time with dirty hands, or when there is kerosene on them.

Starting and placing the machine.—The incubator should be run empty for at least a day or two till quite under control. Place it where a draught is not likely to blow out the lamp at any time, and where the sun cannot shine on it and interfere with the heat. Start going in the morning, and get the day's heat to help. It is also necessary to be about when the temperature is up, and adjust regulator.

The lamps should be filled and trimmed in the evening to get the best heat at night. Have a place away from the machine to do this work. The lamp should be just filled, and best kerosene used. There is a small hole near the filler which must always be kept open to allow gas, which the kerosene

makes, to escape. The burnt parts of the wick should be lightly pulled off daily, and same trimmed smooth with the fingers; cut off the corners of wick with scissors when the flame is higher there than in the centre. When the wick is first inserted pull it backwards and forwards several times to make sure of its running free; try and get a nice oval flame. The brass part near the flame will require the sooty deposit scraping off daily; the brass gauze round under the flame must have all the holes free from dirt, to allow the proper circulation of air. Wash the whole burner in boiling water with washing soda at least after every hatch.

General Treatment of the Eggs.—Put the eggs into the incubator in the morning, and get the warmth of the day to help to heat them up. The temperature of the machine will of course go down and not regain the proper heat for some time; this also occurs at any time when the eggs are taken out.

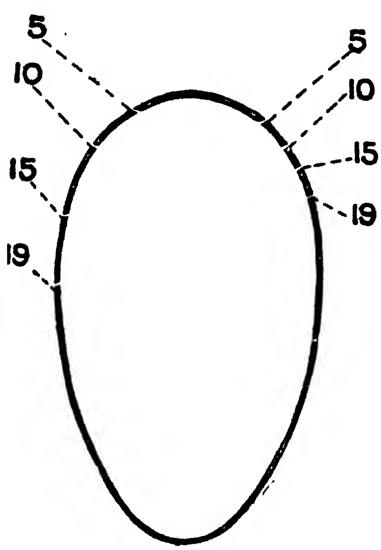
The morning of the fourth day is generally recognised as the right time to next handle them. Lift out the tray of eggs and close the incubator, after a few days the door may be allowed to be opened for a few minutes only, to let the chamber air; now turn the eggs half round or over on the small end and continue this practice twice daily till the shells chip with the chicks coming out. The methods of turning are immaterial, the former is the one used by fowls and the latter by ducks. If the American way is used of placing an empty tray over the eggs and turning the lot over—the eggs will require to be graded to size, or there will be a lot cracked. Turning is necessary to the germ for exercise, and if it is not done the pulsation of the germ will carry it through the protecting layer of white of egg when it will stick to the shell and die.

Moisture.—There is sufficient moisture in an egg to supply needs while hatching under ordinary conditions and proper treatment. The mucous covering on the shell which keeps out the air—the same which is seen rapidly drying when the egg is first laid—is dissolved shortly after the heat of incubation is applied, and allows the moisture in the egg to commence evaporating. For the purpose of stopping too hasty growth of life and helping evaporation, the eggs must be aired and cooled down—the time allowed increasing as the period of incubation grows, starting with just sufficient time to turn the eggs up to three-quarters of an hour.

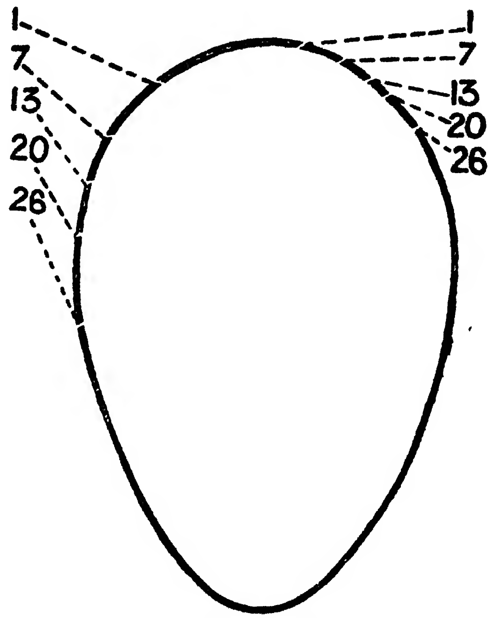
A preferable way to a time-limit is found, however, in trusting to feeling the eggs with the palms of the hands and returning them when just warm. This process will also indicate the hot eggs, generally about the centre in flat trays, and these should be removed to the outside of tray and replaced with cool eggs from there; in fact, shift the positions of the eggs on the tray frequently.

When the application of artificial moisture becomes necessary, let the water be tepid. A tray for the purpose is provided in some machines, but others with slides on the ventilators which control the air outgoing, and consequently moisture, simply require that the slides be shut some little way

generally. To apply water in these incubators a small tray can be found to use, or simply throw the water into the chamber or on the floor under the machine. A helpful guide as to the need or not of artificial moisture is the chart shown in the illustration. This chart is a gauge of the air-cell, the



Hen-egg.



Duck-egg.

empty space on the top of the egg, which increases during hatching, and on the days named the contents of the greater number of eggs should be about down to the mark. If below same, moisture should be supplied or the ventilators closed a little. If above the date, the eggs have not been aired sufficiently or the germs are weak. More turning and airing now is required, and the hatch will often run a day or two overdue. It has been advocated to practise rolling the eggs gently in this case, but it is too much labour where a large number of eggs are being hatched. The amount of water used is about an ordinary tea-cupful to 100 eggs.

The Thermometer.—There are two ways of placing same: hung from the top of the hatching chamber, in the centre, with the bulb just on a level with the eggs, or the thermometer resting on the eggs, with the bulb on two eggs. The former method is by far the most convenient, especially at hatching time, and the other way has no apparent benefit on results.

Testing for Fertility is best done on the fifth day, the germ being very fragile before that date. The leather tester, the size of an egg at one end and large enough to cover both eyes at the other end, is used for testing with sunlight. The egg should be held in position below the level of the face, and the sunlight allowed to shine on it. For night testing, a tester is often

supplied with the incubator, or it is only necessary to concentrate the light on the egg in some manner. A candle or lamp in a box or tin, with a hole the size of an egg cut in it, used in a darkened room, will suit the purpose. The day testing seems the preferable way, as there is less chance of the eggs getting cold.

The Germ is actually alive when the hen lays the egg, but goes into a state of coma when the egg cools off, the visits of the hen to lay the next egg livening it up for a while, and providing against same getting too cold. This points to the necessity of careful treatment of eggs for hatching purposes, already spoken of. Once sufficient heat is applied for thirty-six hours to the germ, same will die if deprived of it. It is not visible to the naked eye with a tester till about the fourth day. It will first be seen in a red spider-like appearance, perhaps with an outside ring. Sometimes one or more veins will be seen descending from the air-cell; but where a vein appears alone and disconnected, or two or one black spots are seen, the germ is dead. If the germ travels round as the egg is turned, it is an indication the bird which laid the egg was too fat, and same is unlikely to hatch. If the egg is clear, except for the yolk, as when put in, the egg is infertile, and these eggs are quite good for use in puddings, &c. Testing should be done again twice, say on the tenth and fifteenth day, to remove any dead eggs.

Hatching.—When the eggs begin to chip on the day or so before they are due, close the incubator, and leave it shut till it is thought all the chicks are out. Where a lower part is provided for the hatched to drop down to, they are doubly safe: but they are well enough on the tray, even if they pant a lot. Opening the door to shift them or help, only lets out heat and moisture, and harms the hatch. As to turning eggs right side up that have chipped underneath, it is not necessary. The makers of some machines advise not to turn fowls' eggs after the nineteenth day, and duck eggs after the twenty-sixth day, to provide against this happening. The completed hatch can be shifted to hens, or a foster-mother heated from 95 degrees to 100 degrees Fahr. No food is necessary for a day, Nature having provided for that in the part of the yolk drawn into their systems. The small piece of skin on chicks' beaks must never be touched; this is simply to protect the beak while knocking against the shell. It will fall off. Finally, as to temperature to run the incubator at—any degree of heat from 97 degrees to 106 degeees Fahr. will hatch, but 103 degrees is considered best for fowls' eggs, and 102½ degrees for duck eggs. Considerable variation over or above for any length of time is harmful. The heat recorded will increase as the eggs are incubated, and must be regulated as necessary. Accidents, of course, will occur—cracked eggs and high or low temperatures—but it is very hard to say what will actually kill the germs, especially if they are several weeks old. In conclusion, run the incubator according to the maker's rules, and do not start hatching unless you have a sure means of brooding, as the raising of young chicks is by far the hardest part.

Diseases of Fowls.

[Continued from page 399.]

G. BRADSHAW.

CHAPTER X.

Diarrhœa, Dysentery, Diphtheria, &c.

Diarrhœa is a discharge of excrement in a fluid or semi-fluid state. It is a very common complaint amongst fowls, and a symptom of several other diseases. We find it in birds affected with consumption of the bowels and liver, and is a pronounced symptom of cholera.

In adult fowls simple diarrhœa can be easily cured, but it is a terrible scourge amongst chickens reared in brooders, particularly in America, where it is termed white diarrhœa.

Unwholesome food, sour or decayed vegetable matter, extreme heat, or impure water may be the cause. Feeding largely on bran may also bring on an attack. Irritants of many sorts may be picked up in the fowls' wanderings, and be responsible for the disease.

There are many and varied remedies. The affected fowls should be separated from the others, and the food supply reduced, rice or oatmeal boiled in milk being the best diet. A teaspoonful of olive oil should first be given. This may remove the irritant, if any, and allay any internal inflammation.

Professor Woodriffe Hill recommends a teaspoonful of castor oil, followed by 5 grains rhubarb, 10 grains carbonate of soda, or 1 grain of opium. Chlorodyne. 3 to 6 drops in a dessertspoonful of water, is also recommended.

Mr. Tegetmeier, poultry editor of the English *Field*, recommends—rhubarb, 5 grains; chalk, 5 grains; cayenne, 3 grains; to be given as a pill at night.

Other formulas are, a teaspoonful of castor oil mixed with 6 drops of laudanum. Personally, I have found nothing more effective than a teaspoonful of prepared chalk, mixed with pollard into a bolus about the size of one's little finger, and dropped down the bird's throat.

The following article on this disease was contributed by a medical authority to an English paper a few months ago:—

Diarrhœa may be simply an upset of the digestive system, or it may be a symptom of some more serious disease. Simple diarrhœa may arise from the presence of some indigestible matter in the intestinal canal, or it may be due to exposure to heavy rain, or to draughts in the roosting-house. Amongst other causes may be enumerated the giving of sour or sloppy food, allowing the fowls access to water that has become heated by the sun, or that has been allowed to stand in the trough from day to day until it has become soiled with excrement and almost putrid. The too free use of animal food, or the irregular use of green food, may also be put down as common causes. When there is indigestible or decaying matter in the intestinal canal it is not advisable to suddenly stop the diarrhœa;

consequently, the first efforts should be directed towards removing the offending matter. For this purpose the simplest thing to use is a small half teaspoonful of Epsom salts to each bird; this can be dissolved in the water which is used to mix the food. The food should be light and nourishing, and well cooked, and if the diarrhœa is persistent, from four to six drops of chlorodyne will be found an unfailing cure; the same may be said of a few drops of spirits of camphor, about four drops for a small hen; but, personally, we prefer chlorodyne to anything else for the purpose. It may be observed that camphor is commonly used in the drinking water of young chicks as a preventive of "gapes," and, being an astringent, often gives rise to constipation and general upset of the digestive system.

The indiscriminate use of hard-boiled egg as food for young chickens and turkeys is responsible for many cases of this ailment. The long-continued use of egg in this form always leads to constipation, followed by diarrhœa; hence many people condemn egg food for young birds, when it is the method of using it that is entirely to blame. Even the much abused "hard-boiled" egg may be safely fed, provided it is so finely chopped that the chicks cannot easily separate the pieces of egg from the crumbs or oatmeal or biscuit-meal with which it is mixed.

A frequent cause of diarrhœa with young birds is allowing them to drink sun-warmed water. If the water is supplied in a shallow vessel, which allows of the chickens standing in it, and so polluting it with their droppings, the soiled water soon goes putrid, and is almost poisonous to the chicks. In very hot weather the water vessel should be emptied and refilled twice daily; careful rearers give fresh water at each time of feeding, but such extreme care is not necessary if shade can be contrived for the water.

Where green food is given at irregular intervals, or where it is fed in quantity after it has been withheld for some time, or where meat is similarly used, bowel troubles may always be expected; when meat has caused the trouble, the droppings are often streaked with blood. For simple diarrhœa in chickens and turkey poults, the best food to use is rice boiled in milk until it is dry; this will often effect a cure without further treatment. In severe cases a couple of drops of chlorodyne in a small quantity of milk, or on a bolus of bread and milk, may be given to each bird. In every instance the cause of the attack must be sought for and removed, or remedies will prove of little avail.

We have so far been dealing with simple diarrhœa, and to many people it may appear waste of time to notice such a trifling ailment. It is, however, well to point out that it may be just a passing derangement of the system due to any of the above-named causes; but, on the other hand, it may be a symptom of far more serious and deadly diseases, such as tuberculous liver or cholera. Hence the need for care and vigilance, as instead of being harmless the discharge from the bird may be a source of infection and a menace to the health of the entire flock.

In a well-managed poultry yard simple diarrhœa will rarely be found, except in occasional isolated cases; its presence is more frequently observed in yards where the feeding is irregular, and where the birds have to a great extent to look after themselves. The owners of such birds need not look for much profit, and will usually be found asking "does poultry-keeping pay?"

Dysentery is a more aggravated form of diarrhœa, and the odds are usually against the bird.

The risky dose of 10 drops of chlorodyne has, however, been reputed the means of saving some lives.

Diphtheria is a highly contagious disease, and is feared by every poultryman, being most contagious, and in many cases proving fatal. The symptoms are a discharge of an ill-smelling sticky liquid from the eyes, nostrils, and the corners of the mouth. In a day or two there is a growth in the mouth and throat of white cheesy-like matter. This deposit sometimes increasing in a day to the extent of closing up the larnyx passage, the fowl dying from want of breath.

The treatment of fowls affected with this disease is anything but pleasant, and as cured ones are most liable to again contract the disease, the majority of poultrymen kill the affected ones on the discovery of the disease, and burn the carcases.

At times valuable show birds take the disease, such specimens being, perhaps, worth attempts at curing.

The procedure is to scrape off the growths with a small piece of pointed stick, then swab out the mouth with warm water, using a small piece of sponge tied on the end of a stick. The throat should be thoroughly dried, and, using a camel's hair brush, paint the sores with the following, obtainable at the chemist's:—Nitrate of silver, 20 grains; water, 1 drachm. This will usually prevent any further growth, the next thing being to look after the bird's health. The affected ones must be separated from the others, and placed in a clean, dry pen. The houses from which the diseased specimens came should be lime whitened, to which carbolic has been added. All drinking vessels and food troughs should be scalded in boiling water and a strong solution of washing soda before being used by the healthy fowls. The runs should be dressed with lime, and allowed a good rest. Those who have cases of diphtheria or diphtheritic roup, will find doctoring both unpleasant, disappointing, and unprofitable, from the small percentage that can be positively cured.

In connection with diphtheritic fowls, it was long an open question whether such was communicable to man, and about a dozen years ago, it was thought the question was settled in the negative. However, of late years, the number of poultrymen in America affected with sore throats has prompted further investigations by the bacteriologists of that country, several of them now being assured that the disease is communicable. The eminent Dr. V. Moore mentions particulars of over fifty deaths having taken place in both hemispheres, attributed by various pathologists to diphtheria, communicated by the presence of diphtheritic fowls. With this question so conclusively set at rest, poultrymen should hesitate before attempting cures on diphtheric fowls, but rather should, on discovery of the disease, kill those affected, and destroy the carcase by fire.

The following article on this disease was lately contributed by an English authority to a London poultry journal, and demonstrates the danger of an outbreak of diphtheria, and was prompted by a discovery made by Dr. Robinson, the Medical Health Officer of East Kent. His attention was drawn to an outbreak of fever amongst the school children in Elham. On investigating he found on the premises some fowls which had diphtheric throats, and that the germs were conveyed to the children by means of the playground dust, and caused the fever, the origin of which had baffled the authorities. A cat which had slept in one of the hen's nests also communicated the disease to a child:—

I am not at all surprised to read of the communication of diphtheria from fowls to children. The wonder is that it does not occur more frequently, and doubtless many cases that would be traceable are never suspected of having originated in the poultry. One of the means of conveyance mentioned in the paragraph is open to question, viz., the playground dust—a necessarily dry product—and it can be taken to heart by keepers of fowls that ordinary dryness (as we commonly understand things being dry) is a destroyer of the germs of this disease. Then the cat seems to have been the medium of conveying the infection in one case, and though my experience of cats is rather limited—being

obtained chiefly from their gardening proclivities—I am inclined to agree with Mr. Aflalo, the naturalist, who, in commenting on this transference of disease, hits very hard at "the harmless and unnecessary house cat" as a go-between for infectious diseases.

We have, however, to concern ourselves with the poultry aspect, and, unfortunately, it is too little recognised among the generality of poultry-keepers what danger there is surrounding an outbreak of virulent diphtheria among their birds. I have always insisted that, directly an attack of this occurs, the utmost caution is required, for one central instance has the gravest possibilities among all the birds of the neighbourhood, and, as now shown, may be also a menace to human life. The safest and cheapest remedy is to isolate any mopy bird, and, at the least confirmation of suspicious throat, to kill, and burn the body right away. Burying in quicklime not less than 3 feet deep is good, but not so final as burning; then to set the house sanitarily in good order.

Commonly with cottage and farm poultry—and it is here that most diphtheritic cases occur—the procedure is to bring the moping, dejected patient into the kitchen, and put it in an open basket on the fire-hearth, to become an object for compassion, and surreptitious fondling, by the children of the family. A few days later one of the youngsters may be down with diphtheria, and the doctor, not knowing there is the decomposing body of a diseased chicken on the adjacent dunghill or ashpit, ascribes the cause to some other quarter; and as the parents are unaware of what the bird died of, and that it was "catching," the true origin of the child's illness is never traced.

When it is remembered that fowls are scavengers by nature, and if the opportunities occur will feed largely on garbage acquired in questionable places, and drink of the filthiest puddle, it is not to be wondered at that in some cases the combination of foul food and water with foul roosting-places sets up this loathsome disorder. Doubtless the time will arrive, and will be welcomed, when fowl diphtheria and fowl diseases will be made notifiable diseases under the Diseases of Animals Acts, for they are apt to be quite as devastating among poultry as, say, swine fever among pigs; and much the same restrictions should be brought to bear upon their keepers. An impost placed by authority on a farm or village where the disease is rife, to prevent the removal of birds for sales or shows, and enforcing the destruction of eggs and infected fowls, would cause the small necessary attention to cleanliness to be observed that the poultry required.

Mention of swine fever calls to mind the great affinity between it and fowl diphtheria, and the question has been raised whether or not they are the same complaint in two different animals.

It will be most frequently found that when one is on a farm the other is prevalent also; but whether this is a coincidence dependent upon the common fact that both originate amid dirty surroundings and filth, or whether the one animal contracts it from the other, is uncertain. One American pathologist, who had also been struck by the possibility of the two diseases being very closely related, says, in a report upon "Fowl Diphtheria," "from the other (*i.e.*, a diphtheritic fowl) were obtained pure cultures of a bacillus not distinguishable from that of swine plague."

In this country we can hardly hope to progress far into the history of poultry diseases until official aid in the shape of grants for laboratory and experimental work and publishing is given; and anyone conversant with the information at the disposal of poultry-keepers in some other countries, and comparing it with that contained in our meagre and frequently absurd text-books on poultry complaints, cannot fail to realise how far we lag behind. I daresay it has come to the knowledge of very few poultry-keepers here that definite experiments have been made in the United States of America by Dr. Veranus Moore, with the object of ascertaining the contagion risk of fowl diphtheria, and as far back as 1895 the proofs were ample. The animals inoculated by virus direct from diphtheritic poultry included rabbits, white mice, grey mice, cavies, and healthy fowls. Taking the results as tabulated, rabbits were very susceptible and died in one to fourteen days; mice in four to six days; cavies developed the bacillus, and were then chloroformed for examination; healthy fowls seemed to be the least impressible, and in many cases, after showing the disease, they recovered.

Continuing, the same authority, in a paragraph headed "The Relation of Diphtheria in Fowls to Public Health," admits that a comparison of the organisms of human diphtheria with those of fowl diphtheria shows the two to be very dissimilar. Notwithstanding this, the liability of human beings to contract fowl diphtheria and *vice versâ* is evident, and he proceeds to give chapter and verse of cases, in both hemispheres, embracing about fifty deaths in all, each attributed, by various pathologists, to a form of diphtheria communicated by the presence of diphtheritic fowls, and he sums up: "The indiscriminate handling of chickens, especially by children, and the exposure of fowls to the infection of diphtheria in the human species, whereby they become carriers of the virus, should be strenuously avoided."

CHAPTER XI.

Various Diseases.

The diseases already treated are the most serious ones to poultrymen, and responsible for the greatest losses. There are, however, many other poultry ailments requiring but a small amount of care to restore the patient. Others, which are of but apparently slight importance, if neglected may result in the deaths of the affected ones, and the disease possibly spread to other members of the flock. These will follow alphabetically.

Abcess.—This is the name as applied to a collection of pus or matter, and may form in any internal or external part of the fowl's body; sometimes the result of an accident, while often the cause is not apparent.

A common place for abcesses is the breastbone of growing cockerels, and usually situated about half way up the breastbone, and may be any size from a marble to, in rare instances, that of a golf ball. The skin on this part of the fowl is very transparent, and the matter is quite liquid, its dark blue colour showing through the skin. These abcesses, or boils, are most easily treated, only requiring an incision, when the watery matter will run out. The wound should then be syringed with warm water, to which a few drops of disinfectant have been added, then dried. The slight incision will heal up without further treatment.

The cause of gathering is usually supposed to be an injury to the breast by flying on to the roosts, and why cockerels should be more liable to the trouble than pullets can only be explained on the ground that, as a rule, the breasts of pullets are better covered with flesh than the growing cockerels, whose breastbones are usually prominent: and it should be noted that, in two instances, when I killed birds with the object of discovering the cause, in both the bone had been injured, it being the seat of the trouble.

Another common location for abcesses, but of another form, is on the ball of the foot, and known as Bumble-foot. The commencement of this trouble is the thickening of the underparts of the foot, which ultimately become inflamed. The tissue under the skin becomes affected, a thick matter then forming. The pressure of the bird's body on the part irritates the trouble, which, if not treated, gradually works into other parts of the foot and leg.

The heavy breeds are most liable to the ailment, Dorkings in particular. At the same time I have seen many instances of it in Leghorns and Hamburgs, while it is not unusual in Bantams, particularly the feathered-legged breeds. Bumble-foot, although at first a simple looking ailment, is really not so; for although slow in development, if not treated, usually accounts for the death of the subject. It is believed to be the result of a bruise from continually being kept on hard or stony ground; while many think it is caused by the fowl's flying from a high perch on to the hard ground. In connection with the latter, I have had experience of keeping Brahmas which were never allowed to perch, and cases of Bumble-foot were in the flock.

The remedial measures are, to pare the hard surface of the swelling and poultice frequently. If pus has formed, then two good clean cuts should be made across the wound in the form of a ×, and the matter squeezed out. Frequently this is of a cheesy nature, and will have to be scraped out with a penknife. The wound should then be washed out with carbolised water, or diluted Condy's Fluid; the foot to be bandaged up with a clean wet cloth, and not removed for, say, a fortnight, at the end of which time the wound will likely have healed, and no further trouble ensue. In cases where the disease has got into the tissues beyond the ball of the foot, it is difficult to effect a cure. Male birds are more frequent subjects of the disease than hens. In relation to this, and the abcess on the breastbone, low perches are advocated, which, if not wholly preventive, will be partially so.

Anæmia.—This means a deficiency or poverty in the blood, and there are many strains or families of fowls which are thoroughly anæmic. The fowls have a pallid appearance, the comb and wattles pale, and the legs usually cold; they have a bloodless look, while the walk is listless and languid.

The causes are frequently insanitary conditions, overcrowding, innutritious food, &c. Fowls of this sort should be got rid of, treatment being both expensive and useless, for even should a cure be effected, these patched-up, doctored specimens will make wretched breeding stock.

Apoplexy is a diseased condition of the brain, frequently the breaking of a blood vessel, owing to undue fulness there. The breaking of the vessel allows blood to escape into or upon the brain substance. The causes are usually overfatness, stimulating food, while some authorities say it may be hereditary. Dr. Woodriffe Hill says:—"The exciting causes are, violent exercise, intense heat, derangement of the digestive organs, over-straining in laying hens, which are frequently found dead on the nest."

The symptoms are, the bird falls to the ground in a state of partial insensibility, and is sometimes found dead. In cases where the fowl staggers and falls down, the simplest remedy is to pour cold water over its head, when there will likely be a recovery. Bleeding is also recommended. This can be readily done by making an incision in the vein under the wing, and taking, say, a tablespoonful of blood from a full-grown fowl. Purgatives should also be given.

Apoplexy is usually associated with old fowls, often show birds, but even when cases are successfully treated, the trouble may return, and each time it is more severe. Like several other fowl troubles, the cheapest and most effective way to treat apoplectic subjects is to get rid of them.

Ascites, or Abdominal Dropsy.—Exhibition hens, if of good quality, unlike market sorts, are often kept till they become diseased, meet with an accident, or die of old age.

A frequent disease, particularly in old fat specimens, is that known as "down behind." The abdomen becomes very large and pendulous, sometimes touching the ground. One form of this is abdominal dropsy. The

enlargement is frequently minus feathers, looks shiny, it feels soft, and is movable. The accumulation is of a thin watery nature, and is sometimes colourless, or it may be straw coloured. The causes are varied. Several scientists who have studied the disease have disagreed as to its cause; the majority, however, think it arises from an escape of water from the blood vessels into the tissues or into some cavity, as the abdomen.

This form of dropsy can be relieved by a puncture with a surgeon's hollow needle, when most of the liquid will run out, but it must be remembered that this is only a temporary relief, there being always a tendency to further accumulation of the fluid. Further, birds that are dropsical have no right in the breeding yard; while even if of otherwise exhibition quality, the enlargement warrants the fowl being disqualified from securing a prize.

Bronchitis.—Bronchitis is an inflamed condition of the bronchial tubes, or air passages, and mostly occurs in connection with roup (which see). Indeed, it rarely exists as a separate disease in a fowl. There is usually a quantity of mucus in the throat, quick breathing, discharge from the nostrils, and, at times, one or both eyes become inflamed; there is dulness and loss of appetite. There are many causes for this trouble. Draughty, or even too close houses have been responsible for attacks, while foul air and filthy conditions sometimes bring it on. Prize fowls sent by rail to shows or private customers frequently develop the disease, or when being carted from a hot show-room to the railway or other destination, get cold, which quickly develops into bronchitis. A difficulty in breathing, and noise or rattle in the throat, and coughing, are sure signs of the disease. Sometimes the noise becomes chronic, and I have known instances where fowls were apparently healthy, with the exception of this noise. The simplest effective treatment is, 2 or 3 drops of spirits of camphor in a teaspoonful of glycerine, two nights in succession, which should be followed with about 10 drops of sulphuric acid in a pint of the fowls' drinking water. Should the fowls refuse to drink the mixture, a spoonful of sugar may be added. In more severe cases, 3 drops of chlorodyne in a teaspoonful of sweet or salad oil should be given, which usually effects a cure.

Bowels, Inflammation of.—The bowels may be the seat of an attack of inflammation, which may arise from exposure to cold or damp, blows or wounds, irritant poisons, or long-continued diarrhœa. Thirst, and a great heat on the under parts of the body, are the usual marked signs of the disease.

The patient should be given a teaspoonful of castor oil along with 4 drops of laudanum. This should be followed by half a teaspoonful of the following mixture every three hours:—

Hemlock juice	2 drachms.
Belladonna juice	12 drops.
Syrup of chloral hydrate	1 drachm.
Syrup of poppies	2 drachms.
Water	1 ounce.

Catarrh, Cold in the Head.—The symptoms are usually a discharge of a thin fluid from the eyes and nostrils, sometimes mucus in the mouth, and sneezing. There may be swelling of the head and eyes, but unlike roup, it is not contagious, but if not attended to may result in that serious affection. Roosting in draughty houses, damp and cold, are the causes of the disease. A cure can usually be effected without recourse to drugs, or at least by the use of those of a simple character.

When catarrh is confined to the eyes and nostrils, it is usually known as cold in the head; the symptoms being watery swollen eyes, a discharge from the nostrils, ruffled plumage, and general dulness. When neglected the nostrils become blocked up, the sticky discharge seals up the eyelids, and the first stage of roup ensues.

When catarrh is noticed, the fowl's head and eyes should be washed with warm water, the fluid from the nostrils squeezed out and syringed thoroughly. This repeated a few times will frequently effect a cure.

The nostrils should be syringed with warm water, into which a few drops of Condy's Fluid or other disinfectant have been mixed, and the mucus thoroughly squeezed out. This repeated two or three times will usually effect a cure.

Lewis Wright recommends a dose of 20 grains of Epsom salts, followed up by 2 or 3 drops of eucalyptus and terebene every three or four hours, or the above may be put in the fowls' drinking water. The majority of colds will yield to the above simple treatment, but the affected bird should be separated from the general flock, and kept in a place free from draughts.

Cholera.—This virulent disease has been previously treated. *Post mortem* examinations show that it is caused by a living germ—"The Chicken Cholera Germ." The germs may be carried in water, food, manure, &c. It is usually fatal in from twelve to thirty-six hours. The symptoms are great thirst, and incessant purging, the evacuations become like rice-water, and later streaked with blood. Treatment has been previously shown.

Consumption.—See Tuberculosis.

Crop-bound.—See Impaction and Inflammation of the Crop.

Cramp.—See Leg Weakness.

Chicken Pox.—See Warts, &c.

Comb Disease.—See Favus.

Catarrh is a simple inflammation of the mucous membranes or linings of the air passages. Catarrh is not roup.

Debility is sometimes known as going light, and is a more general term for anæmia. It refers to a condition in which there is a wasting away, for which there is no apparent cause, loss of appetite and want of vigour being the only observed symptoms. Many causes may be responsible for the disease, the seat of which may be the heart, liver, lungs, bowels, &c. When no cause can be ascertained, the best thing is to try and build up the constitution, and one of the best things for this is a raw egg beaten up in, say, a tablespoonful of cod liver oil, and 1 grain of quinine—one teaspoonful

to be given twice daily. Fine-chopped raw meat is also good, together with a full supply of green food. Half a teaspoonful of Parrish's food given daily will also do good. Another useful remedy is 2 grains of extract of gentian, 1 grain iodide of iron, and ½ grain of nux vomica—made into a pill, and given twice daily.

Dropsy.—The chest, crop, brain, wattles, and other portions of the fowl's body are subject to dropsy. Abdominal dropsy has already been dealt with. After this the most frequent seat is the fowl's wattles, and is most common in the Mediterranean breeds, and often the result of injury. The wattles assume an enormous size. The simplest remedy is to make a clean cut in the lower part of the swelling, when the liquid will flow out. The cavity should then be syringed out with warm water, into which a few drops of Condy's Fluid has been mixed. Following this a teaspoonful of cold water and a few drops of iodine should be syringed into the wound, which will heal up in a few days, and no more trouble ensue.

Dropsy of the crop can usually be relieved by placing the fowl's head downward, and squeezing the crop gradually. Chest dropsy is rarely detected, except by *post mortem* examination.

Egg-bound.—Sometimes a hen is unable to lay her egg, which blocks up the passages from the oviduct. Unless she is relieved, the result must be fatal sooner or later. A hen so affected will be seen to visit the nest repeatedly without result, and will show general distress, with a depression of the wings and tail. The stoppage may be the result of contraction of the egg passage, or an abnormally large egg. If the latter, the remedy is easy; but when the former is the cause, then the matter is more serious. For large eggs, which can be discovered by an examination of the bird, the vent should be softened by salad oil, followed by an injection of the same if not effectual within an hour. Great care must be taken in handling or making an injection, for if the egg be broken the result will probably be fatal. Benefit has been derived also from the holding of the bird above a jug of hot water, allowing the steam to enter the vent. Contraction of the vent is generally accompanied by inflammation, either the cause or the result of the contraction. This can be discerned by heat of the part, and feverishness of the bird. As an internal remedy homœopathic tincture of aconite should be given. The vent and surroundings also should be fomented with a weak solution of aconite.

Dr. Greene, writing on this subject, in "Poultry," England, says:—

The passage of the first egg with every pullet is always a process which is somewhat prolonged, but which seldom has other than a successful termination. Apart from this, however, an occasionally and exceptionally large egg may pass successfully through the oviduct in its plastic state, but on the shell becoming hardened in its short sojourn in the cloaca, it will encounter an outlet which, though of the normal size, is out of all proportion to the gigantic ovum to which it is expected to give passage. Or, again, a somewhat similar condition arises when the egg is of the normal size, but the outlet is narrow. It is a good plan to watch those birds that are about to lay. Should they visit the nest frequently during the course of the day and leave without depositing an egg, it is almost certain that something is wrong; and when a pullet is in such a state there are three good remedies that may be tried. The first is: Take the bird up gently, and hold her so that her

stern is over the mouth of a jug of boiling water, that the steam arising therefrom may get to the parts and help to relax and procure the delivery of the egg. If this has not the desired effect after an hour's rest in a quiet coop, the vent should be oiled gently with a feather, and the hen given a powder composed of 1 grain of calomel and one-twelfth grain of tartar emetic. The powder may be mixed in a bolus of food, and put into the bird's crop. If it be acting properly a marked improvement should be noticeable in the bird a few hours afterwards, while a second powder given two days subsequently will probably complete the cure. It is advisable for a while to feed the fowl sparingly on a somewhat low diet, withholding any fat-forming food, and giving lime-water to drink, after the system is rid of the powder.

Organs of the Female Bird.

1. Suprarenal capsule.
2. Kidney.
3. Rectum.
4. Ovary.
5. Egg.
6. Infundibular end of oviduct grasping a ripe egg as it falls from the ovary.
7. Oviduct.
8. Uterus.
9. Oviduct.
10. Exit opening of oviduct.
11. Outlet of ureters.

Eggs, Blood in.—Occasionally a speck of blood is found in new-laid eggs. As a rule this is the result of over-stimulation, due to too generous feeding, or some spicy condiment, or irritant to the diet.

Of course, the blood is from ruptured blood vessels, and when the blood is found in the yolk of an egg it is the result of the rupture of a blood vessel in the ovarium; and when found in the white, it is due to the rupture of a blood vessel in the oviduct. As a remedy, try the effect of adding a little Epsom salts and tincture of iron to the drinking water. A teaspoonful of tincture of iron is sufficient to add to a gallon of water and 2 tablespoonfuls of Epsom salts.

(*To be continued.*)

Science in Agriculture.

R. HELMS

Soil Bacteria.

A GREAT deal has been written about soil bacteria during the last twenty years, when first they excited attention in the scientific world. Especially those contained in the swellings found on the roots of leguminous plants have come in for comment. Newspapers, copying one another and enlarging frequently on their own accounts, have excited attention to this subject everywhere. Unfortunately, however, through the exaggerations and false deductions promulgated by non-scientific writers, the farmers were led to expect too much, and the promised benefit these micro-organisms were to bring the agriculturists have not been realised in the greater number of instances. The scientists who have investigated the important part bacteria play in connection with the fertility of the soil, one and all acknowledge that the subject is not yet completely understood. At the same time the functions of soil bacteria have been revealed to a certain extent, and also their importance demonstrated. What so far has been definitely established by scientific research and is known of this important problem I intend to repeat in the plainest language possible.

It is always extremely difficult to popularise a scientific subject, or rather to treat scientific matter entirely in popular language. In order to be quite lucid to the non-scientific reader, technical terms have to be avoided, and this cannot always be done, as they have been specially coined to express definite meanings, and, therefore, require to be translated, which frequently obscures their meaning. The disregard of scientific work in the past has been largely due, no doubt, to the fact that scientific research tended to discredit the preconceived notions that had been inherited for generations. Scientists were regarded as abnormal creatures, or mere speculative dreamers dabbling in untenable theories. A number of practical men holding such views are still to be found. Perhaps there is an excuse for it, considering the inherited system of rule of thumb by which their forebears did very well. It is true the work of the pioneer requires no scientific knowledge; the expert axeman, and the man who can handle a team of bullocks or horses well, possesses an advantage over the less experienced, and herein the practical mostly consists. There is nothing to prevent a scientist being a good worker with his hands, but the man who can only use his hands is not likely to make a scientist very readily. This, moreover, is not necessary; a division of labour has its advantages. It is a pleasant sign of advancement in general knowledge that the modern farmer is becoming keen on utilising the achievements of science. The idea of considering a scientist an impractical theorist

or bookworm is becoming a thing of the past, and the man who loudly boasts about his practical knowledge is beginning to be looked upon as being mentally indolent and attempting to hide his ignorance under pretence of superior experience. The valuable services science has rendered agriculture are, however, scarcely realised yet by most people.

Farming is as old as history, and, for the matter of that, science also, but its universal application to agriculture dates back only a few decades. All applied sciences contribute their quota to make agriculture and its adjuncts more profitable now than in former times. Chemistry, pathology, physics, metallurgy, medicine, botany, entomology, meteorology, bacteriology contribute their share. It may be worth while to select a few items which have prominently benefited agriculture, and proved the devotees to science practical men *par excellence.*

Liebig, fifty years ago, invented superphosphate, and laid the foundation of the present universal use of artificial manures. Investigations into the chemical constitution of plants determined their food requirements and laid the basis of rational manuring, and led to the utilisation of many waste products for that purpose. Chemistry has in other ways much enhanced agriculture, and is, without doubt, the science which has influenced modern agriculture to a greater extent than any of the others. The dairymen throughout the world have to thank the bacteriologist for many advantages; and but for Lavall, the physicist, thinking out the separator in his laboratory, dairying would not be profitable in warm climates. Between the botanist and the pathologist means were found to produce rust-resisting wheats, besides ameliorating other plant diseases. By studying the life history of insects the entomologists have found proper ways of suppressing or checking insect pests. The improved knowledge of the metallurgist made it possible to produce cheaper steel and other metals, and thereby cheapened and improved farm implements and machinery. When in the sixties of last century a disease broke out amongst the silkworms in Southern France, killing every caterpillar wherever it made its appearance, and rapidly spreading through almost every establishment for the rearing of silkworms, thereby bringing thousands of silkworm rearers to the brink of starvation, and jeopardising the whole silk industry which gave employment to several millions of people, it was science that came to their rescue through the medium of the great Pasteur. By the attenuated virus of anthrax, discovered also by Pasteur, the means of preventing that terrible disease was disclosed, and thereby Australia has benefited to an enormous extent. Many other similar instances might be quoted in which agriculture has benefited by scientific research.

Bacteria.

From the fact that a number of bacteria are disease-producing in man, beast, and birds and plants, the whole tribe of these minute plants have acquired a detestable reputation in popular opinion. Such a general condemnatory opinion they do not, however, deserve. The mischievous bacteria

and allied forms of micro-organisms, terrible as they manifest themselves at times, are numerically insignificant in comparison with the great number which may be termed either directly or indirectly beneficial to the higher forms of life, and still more with those which are decidedly harmless, and whose rôle in the economy of nature is not understood at present. Many hundreds are well known; and their characteristics have been worked out, and as researches progress they are constantly added to. Being of very delicate structure they are very sensitive to external conditions, especially to the presence or absence of oxygen, which striking characteristic divides them into two distinct groups. Those which require oxygen for their growth, and prosper ill without it, are called aërobic, and those upon which oxygen has a toxic effect, are called anaërobic bacteria.

Nitrogen.

In order to fully understand the importance of the bacteria to be specially discussed, it is necessary to make a few remarks regarding the element nitrogen, which is absolutely needed as a food by all animated nature.

Nitrogen in its simple form is a gas abundantly present in our atmosphere, where it is practically inert, and acts as a diluent of oxygen, the element required by all breathing beings. In this simple form it is otherwise perfectly useless to either plants or animals. Moreover in this state it will not readily combine even with oxygen, almost the only element it attaches itself to when in the elementary state. Plants, however, cannot utilise it unless it has been oxidised into nitric acid. In that form only is it assimilable by plants which possess the power of elaborating it into other complex compounds known by the term of organic-nitrogen compounds, and albuminoids, in which forms it serves as food for animals. The fact must not be lost sight of—that whilst animals require organic nitrogen compounds for their nutrition, plants cannot directly utilise again the compounds they elaborate, but require them simplified into nitric acid. This is done by bacteria, a group of which are called,

Nitrifying Bacteria.

As soon as a plant or animal is dead it is attacked by bacteria whose function it is to reduce it into the elements from which it was built. The same applies to any dead organic substance, the voidings of animals, offal of any kind, stable manure, &c. These bacteria are the putrifying organisms, of which there are a number of forms, and which are the forerunners of the nitrifying bacteria. In the process of decay different gases are evolved during the progress of fermentation. Some bacteria liberate nitrogen, and others ammonia, from the organic nitrogenous compounds. The nitrogen so evolved is lost in the air, but the ammonia, unless the fermentation is very violent, and the bacteria cannot consume it, is fastened on to by a certain type of organism and converted by it into nitrous acid. This is the first stage of nitrification, the organisms bringing the ammonia to a lower state of oxidation than that required by the higher plants. The further oxidation of nitrous

acid into nitric acid is performed by another type, which completes the complex process of nitrification. It will be seen that it requires quite a number of different bacteria to convert the organic nitrogen compounds into an assimilable form for plants. The different putrifying organisms break up the multiform compounds into elementary substances, and whilst ammonia is evolved this is fastened on to by a distinct oxidising organism; and then by another distinct type, that cannot oxidise ammonia, it is further oxidised to the final stage. These breaking-up and oxidising bacteria, it must be borne in mind, work simultaneously from the start of the decay, and in this manner a continuous development of nitric acid is proceeding, always presuming that all the types necessary for this evolution are present. As a rule they are present in every soil that is sufficiently aerated. I found the nitrifying bacteria absent in the samples from very sour or waterlogged localities only, in the many samples of Australian soils I have examined for the purpose.

The importance of the presence of these different bacteria in the soil, and their co-operation, will readily be perceived. All organic matter would remain intact were it not for the putrifying organisms, and unless the nitrifying bacteria were present the nitrogenous gases evolved during the decomposing fermentation would escape into the air. It would be useless to add fertilisers to the land, whether in the shape of green plants, stable manure, or artificial nitrogenous manures (except such containing nitric acid), were it not for the activity of these silent workers. The whole tribe of this soil flora is necessary to prevent a loss of plant food; but if a preference of importance may be assigned to any of them it is the nitrous-acid former which fixes the very volatile ammonia.

These infinitesimally minute plants, which persistently though invisibly retain by their activity in the soil the most precious of plant foods, cannot be too highly esteemed, for upon them depends entirely the productiveness of the land, and the sustenance of life generally.

A few words concerning the effect produced by tilth, and consequent aeration upon the soil flora, is not out of place here. The greatest value of aeration is generally attributed to the oxidising effect it has upon the mineral plant foods contained in the soil, by which these become soluble, and consequently assimilable by the crops. But the effect it has upon the bacteria in the soil, probably, is no less important. The nitrifying bacteria require a liberal supply of oxygen dictated by their functions, whilst on the other hand the greater number of the putrifying bacteria are anaërobic. Aeration therefore encourages the multiplication of the nitrifying bacteria, which is of the utmost importance, as their number is always smaller than that of any other kind, owing to their much slower growth and reproduction, and at the same time the development of the anaërobic putrifying bacteria is retarded by the admission of air into the soil and a too violent fermentation may be prevented. Aeration balances the functions of the different kinds of soil bacteria.

Besides the nitrifying bacteria, a series of other organisms occur in soil, the activity of which is even more mysterious, and which benefit higher life to a considerable extent. These are the

Nitrogen-fixing Bacteria.

The inertness of nitrogen has already been mentioned, and, in reality, only two phenomena in nature are known to oxidise and fix it. The one is the discharge of electricity during thunderstorms, and the other the activity of certain bacteria. At the high temperature produced by the lightning flash the nitrogen combines with the oxygen of the air. How the bacteria fix the elementary nitrogen is an entire mystery. Nevertheless quite a number have been credited with the characteristic of being able to fix nitrogen in a greater or lesser degree. European investigators have proved one or the other, or several, to occur in almost every kind of soil. All Australian soils probably contain similar organisms. In two examined by me I found considerable assimilating power. The quantitative fixation of nitrogen from the air is not very great in these free living organisms, but study may reveal substances that will encourage their multiplication, and consequently, produce greater fixation results. They are naturally all aërobic, and therefore thrive best in open, well aerated soils. A greater assimilating power than is possessed by these free living organisms may probably be assigned to the

Nodule Bacteria.

During a certain period of their existence these bacteria are living free in the soil, but it is not known whether they multiply under such circumstances. When, however, they insinuate themselves into the hair-rootlets of plants, especially those of the leguminosæ, they produce upon them swellings or nodules, wherein they multiply enormously. They then actively assimilate atmospheric nitrogen, and in some way benefit the host plant. How this is brought about is not yet understood, in the face of the fact that the higher plants require nitrogen in the shape of nitric acid to feed them. The fact that these quasi parasites materially benefit their host by the assimilation of aerial nitrogen, however, has been established without reasonable doubt by repeated experiments. Pots filled with sterilised soils, one of which was inoculated with nodule material, have proved the effect. The inoculated pots yielded larger crops, and nodules had been produced on the roots of the plants, whilst on the plants of the uninoculated pots no nodules occurred. In the field many similar results were obtained, and inoculation with artificially reared nodule bacteria has produced remarkable results. On the other hand very many inoculations in the field did not in the least benefit the crops. This non-success of inoculation in the greater number of instances in my opinion is mainly due to the previous presence of the bacteria in the soil experimented upon. The want was already supplied and inoculation was not required.

A difference of opinion still exists as to whether the nodule organisms found on different plants are distinct, or merely varieties of the same species. Latest researches tend towards the latter opinion, and probably, correctly, as recently some German experimentalists have made the nodule bacteria of French beans, after two or three generations, effectively accommodate themselves to other leguminosæ. But this is merely an absolutely scientific question; the fact remains that these bacteria are so different in their character as to require for successful inoculation that the soil on which the particular crop is grown must be inoculated with cultures taken from the nodules of similar plants.

These nodule bacteria, like the other nitrogen assimilating organisms and the nitrifying bacteria, are also emphatically aërobic; neither they nor the other kinds can, consequently, live deep in the ground. At a depth of from 4 or 5 inches from the surface they generally thrive well; below 6 inches they begin to occur sparingly, and deeper than 9 to 12 inches they are only found under exceptionally favourable circumstances.

The benefit lucerne fields receive from harrowing in spring is no doubt partly caused by enhancing the bacterial activity through the aeration of the soil surface.

In conclusion I draw attention to the universal axiom, that nature constantly works with exceedingly small quantities. As an example we may take one of the nodules attached, say, to roots of lucerne; not a millimetre in diameter, it frequently contains from 500,000 to 1,000,000 of bacilli, and yet every individual of these assimilated some nitrogen. When we consider the minuteness of the individual organism, how infinitely small must be the quantity of nitrogen absorbed by it. Even the quantity fixed daily by a million is so minute that the most delicate balance would scarcely weigh it, and chemists can weigh to the one hundred thousandth part of a gramme. According to Paul Herre, 2,000,000 of organisms only weigh 1 milligramme (the thousandth part of a gramme). The number contained in an acre of soil in order to bring about the assimilation of 10 to 20 lb. of nitrogen is, therefore, so prodigious that expressed in figures they would cover a couple of lines of this page. Bacilli vary in size, but it takes generally from 15,000 to 30,000 laid lengthways to measure an inch, and yet the results produced by them in a very short time are considerable.

Progress Report from Mr. W. W. Froggatt.

[Mr. Froggatt is travelling on behalf of the Governments of Queensland, New South Wales, Victoria, and South Australia, in quest of means of combating the Fruit-fly and Codling moth pests, and other fruit and plant diseases.]

Constantinople, Turkey,
29th April, 1908.

Sir,

I had the honor to forward to you a progress report on my investigations when passing through Cuba and the West Indies, posted on my arrival in London on the 10th of February.

I herewith furnish a brief report upon my work in England and while crossing through Europe to this place, which I leave on the 30th for Cyprus. As soon as I arrived in London I called upon Mr. Coghlan (Agent-General), and, at his suggestion, upon the respective Agents-General of the other States I am representing. I then presented my credentials to the Chief of the Entomological Staff, who took me round and introduced me to all the officers of the Zoological Department, and placed all their immense collections of material at my disposal. Here I spent all the spare time at my disposal going through the *diptera* with Mr. Austen to see all their species of fruit-flies, and, though the Economic Branch was discontinued last year, I obtained a great deal of valuable information from the officers and the examination of the collections in their charge.

I visited the Zoological Museum at Cambridge University, where Dr. David Sharp is in charge, and spent a day going through their collections, which contain many Australian specimens, and noted the methods they adopt in the mounting and preservation of their museum specimens. Later on I visited Oxford University, and, in the absence of Prof. Poulton, was shown the collections by Commander Walker, who for some years was stationed at Sydney, and welcomed me as an old friend. Here are deposited the very extensive Hope and Westwood collections, containing the types of many Australian insects of economic importance, among them a collection of scale insects, probably the first made of these obscure and then little known insect pests. The collection of *diptera* contained many specimens of fruit-flies, some of great interest, several specimens of Mediterranean fruit-flies captured in London, noted in Westwood's handwriting in 1840. At the invitation of Mr. G. H. Verrall, of Sussex Lodge, Newmarket, who has the Bigot and Meigen collections of *diptera* in his great collection, I spent two days at his place examining these collections, where also there are many Australian types, and established the habitat of a number of *Dacus* and other fruit-flies in Cairo, India, Africa, and the Malay Islands, and found specimens of *Ceratitis catoirei*, closely allied to *C. capitata* but only recorded from Mauritius and the Island of Bourbon, which I think is a distinct species.

At the invitation of the Hon. C. N. Rothschild (who is the greatest authority on that important group of insects, the fleas), I spent a very interesting day with the Director (Dr. Jordan) at the Tring Museum at Tring Park, one of, if not the finest private collection of natural history specimens in the world. As you are aware, the bubonic plague and, it is suspected, leprosy even, has been spread to man by fleas, so that much attention has been paid during the last few years to these insects.

I visited the Tropical School of Medicine attached to the Liverpool University, where Mr. Robert Newstead, the leading economic authority in England, has charge of the entomological work, where the identification of all the insects and their parasites which have been found or are suspected of spreading tropical diseases, such as malaria, yellow fever, and "sleeping sickness" are collected and preserved. At the present time this Tropical School of Medicine, which has made such wonderful discoveries in medical entomology, has three expeditions in the field—two in Egypt and Central Africa, and the third in Brazil. This institution is well supported by the merchants of Liverpool, and at the present time they are subscribing funds to establish a Professorship of Entomology in connection with the University. The damage to trade in Central Africa caused by "sleeping sickness" can hardly be estimated. The presence of the blood-sucking fly, *Glossina nobilis*—closely related to the much better known Tsetse fly of more southern Africa—has altered the whole trade relations of a vast territory, and is spreading every year. This fly, by biting man, introduces an organism known as *Trypanosoma* into the blood and causes the death of infected persons. Just after I left London an International Sleeping Sickness Conference was held in London, where scientific men from Germany, Belgium, France, and England met, and I may be allowed to insert the following note from an African newspaper of last month, in which, speaking of sleeping sickness, the writer says:—

> It is hardly seven years ago since the terrible and at present incurable malady known as *Trypanosomosis* or sleeping sickness first made its way into Uganda from the Congo basin. In a few months it spread with terrible rapidity, and, within a year of its appearance, over 20,000 people died in the single district of Usoya. Since then the population of the districts on the lake shore, and of the islands, has been practically wiped out. Brayoma Island, a few years ago, counted a population of over 30,000. Two-thirds of that number have already died, and, as the rest are all believed to be infected, it is only the matter of a year or two before the complete extinction of the sturdy race of islanders who defeated Stanley and Metesa of Uganda and were with difficulty subdued by Sir F. Lugard. In all, some 200,000 out of 300,000 are estimated to have died already in the infected area.

I also visited the London School of Tropical Medicine, where I met Sir Patrick Manson, the Director, and Colonel Alcock, late of the Calcutta Museum, but now in charge of the entomological work of this institution. This work is carried on with the Sailors' Hospital at Woolwich, where all seamen infected with malarial diseases are received.

Among a number of other institutions visited I might note the London University, where Professor Hill, late of the Sydney University, showed me over the biological section, and the Nottingham University, where Professor Carr has charge of the economic entomology. Here also I met the Rev. F.

Thornly, who has charge of all the Nature Study work done in the schools of Nottinghamshire and Leicestershire.

The only Agricultural College in England with a scientific staff doing original investigation is Wye Agricultural College, in Kent. Here I met Mr. F. V. Theobald, the Vice-Principal, who has charge of the economic work, and went all over the laboratories, and through the orchards and experimental farms with him. One of the most important diseases at present under observation by the Pathologist (Mr. Salmon) is "warty disease" or "black scab of potatoes" (*Chrysophlycetis endobiotica*, Schb.). Introduced into England about 1895, it has spread over nine counties of England and Scotland, and Mr. Salmon says could be very easily introduced into Australia with seed potatoes. I would suggest that it be proclaimed a disease under our Vegetation Diseases Act, and that a close watch be kept on seed potatoes coming from England.

Another fungus disease that has caused so much anxiety among fruit-growers in Great Britain that the Board of Agriculture has had a Vegetation Diseases Act passed a few months ago to deal with it, is American Gooseberry Mildew (*Sphærotheca morsuvæ*), and proclamations have been distributed and stuck up all over the country districts warning growers to look out for this pest on their gooseberries. Mr. Theobald informed me that in the pear orchards of England probably the worst pest is "bud gnat," a small fly (*Diplosis* sp.), which lays its eggs on the opening flowers, in which the maggot feeds, causing them to swell out and then drop off. There is also a small mite that damages the young gooseberries in a similar manner.

Blight-proof stocks are unknown among the apple-growers in England; most of their apples are grafted on the Paradise stock, which is very much subject to "American blight." Codling moth is very common, but most of the wormy apples are made into cider, and very little trouble is taken with them. Canker in the bark is very common, and attacks every bit of injured bark, often killing the trees.

At the request of Mr. F. Cooper (of Messrs. Cooper and Nephews) I visited his laboratories at Watford, where chemical combinations for dealing with parasites of plants and animals are studied. He is doing some fine scientific work in conjunction with Professor Warburton, of Cambridge University, in the study of cattle-ticks, and making very fine photographs and anatomical drawings of all the known species. Through want of time I was unable to visit their other establishment at Berkhamstead.

At the request of Mr. Taverner (Agent-General for Victoria) I called upon Mr. Middleton, in charge of the experimental work of the Board of Agriculture at Whitehall Place, who, with Mr. Rogers, of the Intelligence Branch, gave me some information as to their methods of administration and carrying out experiments.

I was able to attend the monthly meeting of the Entomological Society of London, where, at the President's request, I gave the members a short address on our economic work in Australia, and met many of the leading entomologists of Great Britain. I also attended the monthly meeting of the

Linnean Society of London at Burlington House. Having been four weeks in England, and gone through most of the important economic collections, I left for France on the 10th March and reached Paris the same evening. I engaged an interpreter, and next morning called upon Professor Marchal, at the Department of Agriculture, and with him I spent three days, first going through his collections and noting his methods of work, and then in various institutions. At the Jardin de Plantes I found the Natural History Museum very beautifully arranged for the public, the nests of insects being particularly fine, and went through the cabinets of *diptera* and other specimens. Professor Marchal informed me that the Mediterranean fruit-fly has on several occasions been taken in the orchards near Paris, but it has never become established, and has probably been brought in the larval state with imported fruit. The olive-fly, *Dacus oleæ*, is common in several districts in the south of France, but has never become a serious pest, and they have no vegetation diseases law to deal with anything but phylloxera. I met the professor at the Pasteur Institute which has charge of specimens connected with the tropical diseases, and attended a meeting of the doctors on "sleeping sickness," upon which they are carrying out many investigations. I was also fortunate in attending the monthly meeting of the members of the Entomological Society of France, and there spoke on our work in Australia, my remarks being translated into French by Professor Picet. At Professor Blanchard's laboratories I met Dr. E. Brumpt, who has worked on biology in Central Africa, and is now investigating the fowl-ticks and their methods of transmitting diseases. At the College of France I met Dr. Felix Henneguy, who had done a great deal of fine work on the morphology of insects. With Professor Marchal I went through the Experiment Gardens at the Luxemoburg, and also to Professor Griffon's laboratories and experimental grounds, he being Vegetable Pathologist to the Department of Agriculture and Director of the Grenoble Station. On the 13th March I left for Madrid, and reached there on the following day. I first went to the Museum of Natural Sciences, where I examined the collections and met Dr. Bolivar, the Director, who said they had plenty of specimens of olive-fly, but none of the Mediterranean fruit fly, though it was at times a pest in the south of Spain. I visited the Agricultural Experiment Station and College where the Director, Professor Navarro, gave me a great deal of information about the insect pests in Spain, and advised me to go to Valencia to see the orange orchards. I inquired about Mr. Compere's statement that has been so widely circulated through the newspapers, "that there was no codling moth pest in Spain on account of the parasite he discovered there destroying them." Professor Navarro said "that, from his own observation, he knew there was hardly an apple grown in Spain that was not damaged by the codling moth, but as there was no export trade in apples, and the whole of the crop was usually turned into cider, the growers took no notice of wormy apples—they all went under the press." Next day I called upon the Minister, and Director of Agriculture, and the latter so strongly advised me to visit the Valencia district that I arranged to take my interpreter, and visit the

place, where the Department also have a large experiment station. From Madrid I left the following night for Valencia, *via* Barcelona, arriving there early next morning. At the last named town we found that we could not get a train till evening and were all night in the train but saw all the country returning.

The whole of the land between the sea and the mountains south of Barcelona is well cultivated, the poorer land growing olives, which apparently grow without any soil as long as they can get their roots into the limestones. Where nothing else will grow the olive tree finds a living. At Tarragona there is a large alluvial plain, well irrigated, where a great number of different kinds of fruit-trees and vines are grown; then more poor country growing olives. At Castellon the orchards are all oranges between the sea and the mountains right down to Valencia, and the whole of the land is under irrigation. The crop was being gathered, and great piles of low-grade fruit were scattered about the orchards and lying about the railway stations where they were packing. Dr. Marti (director of the station) says that fruit-fly is practically unknown in the Valencia orchards, but further south, at Malaga, in the months of September and November, *Halterophora capitata* often does a great deal of damage, but no methods are adopted to deal with it, though there is at present a Bill before the House of Parliament to give the Department of Fomento power to destroy all infested fruit in the orchards. Outside Valencia great quantities of vegetables are grown, particularly potatoes, in small fields, all under irrigation from the mountain streams.

From Valencia I went straight through to Montpellier (France) to the celebrated Viticultural and Horticultural School, and though the Director was away in Paris, through the kindness of the Secretary I went over the Entomological Division under Professor Mayet, and through the experiment grounds. Among some interesting experiments noted were those of growing plots of vines in ground covered with a porous cement made of slag and concrete, and the surface painted in different colours; under similar conditions, ground covered with a coating of river gravel and flag-stones. From here I went to Marseilles, and was fortunate in catching a boat leaving for Naples next morning.

I landed at Naples on the 27th March and went out next morning to Portice to the R. Scuola Superiore di Agricoltura, where I met Professor Silvestri and the members of his staff and obtained a great deal of interesting information regarding the destruction of the olive oil industry by the ravages of the olive fruit-fly *Dacus oleæ*.

To give some idea of the actual damage done, the following figures from their reports may be quoted:—

	hectolitres.
In 1879–83 the yield of olive oil in Italy was ...	3,390,000
„ 1884–89 it dropped to	2,354,000
„ 1890–94 it rose to	2,514,000
„ 1895–99 it fell to	2,005,000

(one hectolitre equals 22 gallons),

and has not improved since the last records were compiled, and as each hectolitre is valued at £4, the loss is a national one. There is a standing reward offered by the Italian Government of 6,000 lire for any effective remedy for the destruction of the olive fly, so that all the Italian entomologists are turning their attention to this pest. Professor Silvestri is a great believer in its control by parasites, and parasites alone, while the other side, represented by Professor Berlese at Florence, though they believe that the indigenous parasites will do some of the work, also advocate the use of mechanical means to supplement the work, and Berlese has used a mixture he has compounded of a sweet spray consisting of arsenic, honey, and molasses diluted with water which he has sprayed over infested areas with marked success, the adult flies coming into the poison and dying after feeding upon it. The chief difficulty is the expense, and the fact that heavy rain washes it off. He is now experimenting with jars or small bottles containing this mixture hung in the trees with bundles of cotton threads placed in the bottles and trailing several feet, down which the fluid is drawn, and upon which the flies rest and feed.

Professor Silvestri claims that, if sprays are used, all the parasites will be destroyed, but up to the present, as far as I can learn from both sides (though there is much more hope for a parasite to be effective in a thin fleshed fruit like an olive, where the maggot is close to the surface, than in an orange where the maggot is out of reach), after all these years, where the parasites have had a fair field, with nothing to disturb them (and quite a number have been bred from the fruit-fly maggots and pupæ of the olive flies) yet they have not checked their increase.

At Professor Silvestri's suggestion, furnished with a letter of introduction to Dr. Perez in charge of the Agricultural work in Sicily, I started off to Palermo by the mail-boat, reached the town at daylight, roused him out of bed at 7·30 on Sunday morning, spent the day with him in the lemon orchards outside the town, and left for Naples again the same night.

In consequence of the bad condition of the lemon trade, the greater part of the crop is still on the trees. There is a large area of rich volcanic land between the mountains and the town covered with orchards, the greater part of which are devoted to lemons, all of which are under irrigation. Most of the trees are small, though many of them are sixty or seventy years old, because they are planted so close together, and as they are all grafted on sour orange stocks about 4 feet above the ground, have all their foliage above interlacing their branches, and thus form a regular thicket, so they have little chance to expand. They claim that this high grafting or budding (for they do both) prevents collar rot or gumming. Dr. Perez says that every year they lose a certain percentage of the oranges in Sicily and on the mainland in Southern Italy from the fruit-fly, but it is not considered a serious pest, and no precautionary methods are adopted against it. From Naples I went to Rome, where I stopped a day to see Dr. Grassi, the great authority on White Ants (*Termitidæ*), and went over the Agricultural Museum, where there is a very fine collection of agricultural products, among them a number of samples of

wool "from Van Demonsland." Next day I reached Florence, where I particularly wished to meet Prof. Berlese, who has done so much work on fruit-flies. When I reached his laboratories next morning, I found he had just left for Genoa, so telegraphed to him that I would follow on next morning. His staff showed me all their methods of work, and particularly their experiments against the olive flies. One of the worst scale nsects in Italy is *Diaspis pentagona*, which attacks the mulberry, and if neglected often kills the trees. It is this scale that Prof. Berlese had gone to report upon, and had taken some *hymenopterous* parasites he had received from Japan to liberate them in the mulberry gardens north of Genoa. I arrived at Genoa that evening, met Professor Berlese, and had an interesting talk with him on his methods of dealing with the olive flies, and gave him some idea of what we are doing in Australia. I saw him off next morning, and then called upon Dr. Gestro, who has charge of the Genoa Museum, where the D'Alberti collections, made in New Guinea, are deposited. I also went to the botanical section of the University of Genoa, where they have a very fine herbarium and collection of living plants.

From here I went to Vienna, *via* Milan, where I had to change trains, and left the latter town at midnight, and passing through Northern Italy, reached Vienna the following night. Next morning, I went to the Museum, and met the Director, Dr. Ganghbaur, who introduced me to the staff, and placed the collections at my disposal. This museum contains some very valuable collections, and is particularly rich in economic ones, such as Signoret's collections of scale insects, *Coccidæ*, and the combined collections of *diptera*, made by Schiner, Weidmann, Mik, Meigen, and Loew. I spent a considerable time over these collections, and made many notes on Signoret's types of Australian scale insects, and a number of notes on the named fruit-flies in the *diptera.*

I then visited the laboratories of the Experiment Station of the Department of Agriculture, where I was shown over the buildings, and met Drs. Wahl and Fulmer, who have charge of the economic entomology and vegetable diseases of plants, and have made collections of all the pests found in Austria. Among the leaf devouring caterpillars, the class of the web moths seem to be the worst, while several weevils of the genus *Cleonus* do a great deal of damage to sugar beet. After another morning in the museum, spent the afternoon at the chemical laboratories, veterinary branch, viticultural and peat branch. The latter deals with the utilisation of the large deposits of peat which is largely used for fuel in manufacturing spirits. The Fisheries Branch was closed, as they had a show on at the Agricultural Show Grounds. The following morning left for the Show Grounds at St. Marx at 7·30 and reached there a little after 8, before the crowd. The fish exhibit consisted of about 300 glass-fronted tanks placed around the walls full of living fresh-water fish (for which Austria is noted), some of the fish so large that there did not seem to be room for them to swim. There must have been at least 10,000 living fish exhibited, besides quantities of the small fry, showing their development. I was invited to a conference of the Fisheries Experts by one of the Commissioners to whom I went for information, but had to leave

before it took place. The next and most remarkable exhibition to an Australian was the collection of and the interest shown in rabbits. I counted 600 cages, most of them containing three or four animals, and comprising all the breeds and varieties known—Belgian, Russian, Japanese, etc.—many of them grown to a great size—larger than hares. The judges weighed each animal on the scales, measured it even down to the length and shape of its ears, and I wondered what an Australian squatter would have thought of this section in our Royal Agricultural Show.

The other sections consisted of pigs, of which there were a great number, chiefly White Yorkshire, and cattle, chiefly Swiss; besides these were manures and agricultural implements, chiefly of English manufacture. From here we went on to the Natural History Museum and went through the general collections on the three main floors with the Director, who explained the plan of arrangement; then returned to the offices and went through injurious *lepidoptera* with Professor Rebel, who, besides being in charge of this Department in the Museum, lectures to the students at the Agricultural Department.

Next afternoon I left for Budapest, arriving there the same night, and the following morning met Dr. Horvarth, Director of the Royal Museum of Hungary, and with Dr. Kertesz, one of the greatest authorities on the *Diptera* (flies) went through their collections and obtained a great deal of information about the distribution of the fruit-flies, particularly those collected some five years ago in the East by Biro. In the afternoon visited the Central Bureau of Ornithology under the charge of Dr. Otto Herman, who has raised this branch of the Department of Agriculture into one of the best known in the world, second only to the United States Bureau of Biological Survey at Washington. Under this, useful birds are protected, both on account of their insectivorous habits and value as game birds. Exhaustive studies are made on the migration of birds; and nests are constructed in large quantities and placed on the islands in the Danube and distributed among the forest guards and inspectors. Through the schoolmasters, literature on the value and uses of birds, and even specimens, are given to the children's school museums.

With Dr. Horvarth, called upon the Minister for Agriculture (Dr. Daranyi) who is one of the foremost agriculturists in the country, and afterwards went to the Agricultural Museum, which is unique in its way, and has the finest collection I have seen. It comprises all kinds of agricultural implements, all products made in the country, raw products, models, and pictures of all kinds of stock and methods of dealing with them. It includes all branches of forestry, animals, and birds found in forests, and dead and living fish, the old and modern weapons used in hunting, and the harness and implements used by shepherds, stockmen, and fishermen. The collection is beautifully arranged in a very fine building built on an artificial island, which cost £50,000 when built as part of the Hungarian Exhibition. I also visited the city markets, another fine block of buildings, where every kind of product is sold, from flowers and fruit to the curious curly-haired Hungarian pigs, lambs, and fish—the latter alive in tanks. All the oranges in the market belonged to

two kinds of blood oranges, sweet but rough-skinned, and said to be imported from Italy. The technical branches of the Department of Agriculture are housed in a very fine set of modern buildings on the Buda side of the Danube, and have fine grounds and experiment plots of ground round them. Here I met all the experts, consisting of the Chief of the chemical branch, viticulture, pathology, entomology, &c. Dr. Fablonowsky, the Assistant Director, is also the Entomologist, and has a very fine collection of all kinds of injurious insects and samples of the damage done by them exhibited in cases. The phylloxera here, as everywhere else in Europe, has done an immense amount of damage to the viticultural industry, and here in all clay or loamy soil they are replanting with American stocks, or going into the light sandy soil of the hills, where the phylloxera cannot exist. This has to a considerable extent changed the nature of their vintage, and they produce a great deal of light wine that is chiefly sold in Germany and Northern Europe, but will not sell in England. The Government have constructed some very extensive wine cellars in the side of the mountain, outside Buda, down the river, where they mature a large quantity of wine grown in their own vineyards of 2,500 acres. Here they also have a staff and train ten young men as "cellar-masters." I visited these cellars, and was shown all over the institution, where they also hold auction sales of wine four times a year.

I also had the opportunity of going down to Nyir Egyhaza, near Tokay, at the invitation of Dr. Kallay, and on Easter Sunday visited some vineyards, where I found the rows are planted so close together that everything has to be done by hand once the vines are planted. Most of the small growers here sell the grapes, or simply press the grapes and sell the must to the larger growers who have wine cellars. All the soil here and round the hills of Tokay is a very fine sandy soil, and phylloxera proof, with few exceptions.

On the 21st April, 1908, I left by the Orient Express at midnight for Constantinople, on my road to Cyprus and Cairo, and reached there on the morning of the 23rd. Soon after my arrival, found that I could not get a steamer till the 30th, so called upon the British Consul, who very kindly gave me letters to several people interested in agriculture.

At the invitation of Dr. Thompson, a British merchant interested in wine culture, and having large vineyards at Bolandjvk, about 12 miles out in Asiatic Turkey, I spent Sunday afternoon at his orchards, and saw the methods used also in some Turkish vineyards adjoining his. At one time they made a large quantity of wine, but through the bad times that came to the Armenians, the chief wine-drinkers in Turkey, they have given up making wine, and sell the grapes for eating.

All the orchards through Turkey have been more or less destroyed by the phylloxera, which appeared about twenty-five years ago. Mr. Thompson's vines, now twelve years old, are all grafted on American stocks, and are some of the largest vines I have seen; they are simply staked, and tied up at the top. Most of the Turkish wine growers graft on a native grape that grows wild in the country.

With a letter of introduction, I called upon Monsieur C. de Raymond, Inspector, Technique de la Dette Publique Ottomane, who has charge of the work done in connection with helping the vine and silk industries. Mr. Raymond informed me that they distributed cuttings and mulberry plants free to encourage the industry, and the introduction of silk has increased in Turkey in Europe from 1,871,739 kilos of cocoons in 1902 to 3,623,145 kilos in 1907. A kilo is 2 lb. 8 oz. Wine making is in a very bad way, but the Smyrna raisin industry is one of their big industries. This Department also deals with forestry and fisheries, but does no replanting—simply collects the license money from the timber getters.

In the fruit markets, one of the sights of Stambul, there are a great many varieties of oranges and other citrus fruit offered for sale, and I am informed that the commission agents fix the selling price to the retailers every morning. The Jaffa orange is a very large long orange, with an extremely thick skin, but has a very fine flavour and very few pips. They vary from 1d. to 1½d., buying from the basket-men. A very fine blood orange, and a fine round orange with a thinnish skin, comes from Syria, from whence also comes a very large deep-coloured mandarin, which has a very loose skin, and is as sour as a lemon; these I am told are boiled in sugar and made into sweetmeats. Large quantities of the lemons, and some oranges also, come from Sicily and Italy. I saw no signs of fruit-fly among them, but scale was pretty thick upon some Syrian ones, *Aspidiotus hederæ*, probably, and *Chionaspis citri*. Apples are scarce and very poor at this time of the year. They are chiefly grown at Amasa, in Turkey in Asia, and are a small red variety. Bananas are practically unknown in the markets, but some come to the fruit shops from Egypt and are a luxury.

The vegetables are very fine and of many kinds—nearly all grown in the Asiatic side of the Bosphorus,—while dried fruits and all kinds of nuts, grain, and legumes are very abundant and cheap. There was almost a total failure of the harvest in Asia Minor last season, and rain is wanted very badly now. All the vineyards are dug by hand, the Turkish labourer using a very heavy fork with two straight prongs and a long handle, and two of them working together turn over a great mass of soil at each dig. They work from 7 o'clock in the morning to 6 in the evening, and get 1s. 4d. a day.

I leave here to-morrow at 4 p.m in the M.M.S. Co. boat for Cyprus, and should reach there on the 4th or 5th of May, and should leave there a week later for Cairo.

I have, &c.,

WALTER W. FROGGATT.

The Hon. the Minister for Agriculture,
Sydney, New South Wales.

Dairying in the Argentine.

PAPER READ BEFORE THE CO-OPERATIVE BUTTER FACTORY MANAGERS AND SECRETARIES' ASSOCIATION CONFERENCE, 16TH APRIL, 1908.

L. T. MACINNES,
Dairy Branch, Department of Agriculture.

I HAVE been asked to read a paper at your conference, taking for my theme, "Dairying in the Argentine Republic."

This subject, I hope, will prove of interest to you, especially when you take into consideration that South America is a country where work is carried on under exactly similar climatic conditions to those we experience in Australia.

Their butter factories reach their maximum output during the same months of the year as ours, and they place their exports on the same markets.

My observations are the result of some years' stay in the Argentine, during the whole of which time I was actively engaged in the dairy industry—at first amongst the milking herds, afterwards on the manufacturing side—so I think I can claim to have had a good practical experience of their methods of handling dairy matters, from the milking yard up through all the various processes until the manufactured article is placed on the world's markets.

Modern growth of Dairying.—Modern methods of dairying are quite of recent growth on the River Plate. Prior to 1896 the mechanical separator, the creamery, and the butter factory were practically unknown. Now they are quite up-to-date in these things.

System of Milking.—But while the manufacturing side of the business has progressed, the system of handling the milking herds is quite out of date. The Argentine dairyman, whether in a large or small way, generally considers the milking of cows as but an adjunct to fat-stock raising. The opinions of the owner of the station on which I was engaged are typical of the country. He said it paid him if he only cleared working expenses out of his milk—the real profits lay in the quietening of his young stock, through constant handling in the yards, for exportation alive to England. That is what the Argentine cattleman always strives for—the re-opening of Britain's ports, closed a few years ago on account of the foot-and-mouth disease, to the live-stock trade. When I went to take up my duties first on the station on which I was engaged, the owner wanted to have the establishment run on Australian lines; but, on hearing that the calves would be hand-reared, he said that would not suit him at all, so things went on in the old-fashioned way during my stay, except that they saw the benefits of hand-feeding during the winter months. He scouted the idea that the gain in quality and quantity of the milk by hand-rearing the calves would more than make up for the loss in the calves through poddying them. He would not even let me show him in a practical way the profits he was losing by adhering to his old style of doing things, even though he had some 3,000 milkers on the place.

Share system.—The large owner mostly dairies on the share system. He finds the land, subdivided into the necessary paddocks, stock, and working plant; the latter including a complete creamery outfit. The dairyman finds all the labour required in connection with the milking yard. The cost of running the creamery, freights on cream, cartage, &c., are deducted from the gross earnings, and the net returns halved between the two. Where more than one yard of cows is milked a tally is kept of the quantity delivered daily by each, and their accounts are reckoned out on that basis. When we gave a man charge of a yard he was given two lots of cows with their calves at foot—from 80 to 100 in each lot. One herd was for milking in the morning, the other for evening milking. In addition, about 100 to 150 springers and dry cows are kept in reserve to keep the yard up to its full capacity all the time. It takes about 300 cows to keep each yard going in full swing all the year round. Each tambo (local name for dairy) had the run of two paddocks—one for each lot of milkers. The springers and dry cows belonging to the various tambos were run in a common paddock, each different lot having a distinctive brand, sometimes on the horn, mostly dew-lap, or ear-mark. The milking is done out in the open—no shelter whatever is provided, not even a tree. The yards are of light structure, wired; small round hardwood posts, mostly as crooked as a ram's horn, are sunk in about 3 feet, every 30 yards; in between, the wires are run through stays. Adjoining the milking yard, a smaller one of similar structure is put up for the calves. After the morning's milking is done, the calves of the second herd are parted from their mothers—with whom they have been running all night. Later on in the afternoon they are penned up whilst the cows are yarded for milking. By this system, each herd is without its calves for twelve hours. Three milkers and one tier-up do the work of each tambo. No bails are used. To start operations, several calves are let out into the big yard—they immediately seek out their mothers and commence sucking. The cow's hind legs are at once tied together, just above the hocks, with a green-hide rope; the calf is dragged away from the teats, and tied by the neck to the off-side front leg of its mother. The cow has by this time let down her milk, so the milker squats down with his bucket (he carries his stool strapped to him). As soon as he gets his quota he lets loose the calf, unstraps the cow's legs, and goes on to the next, whom the tier-up has by this time ready hobbled for him. The calves are let run with their mothers till next morning, and get the best part of the milk. Some keep special teats for the calf to suck—two when very young, one when older. When this is the case the cow is milked night and morning. A couple of posts are firmly set in each yard for tying unbroken cows to. These latter are lassoed, and dragged up to the post by the lassoer on his horse. To this post they are lashed by the head, and their hind legs tightly tied together, so that they cannot move an inch. As soon as a yard gets dirty, the fence is removed in a few hours to a fresh spot. It is not to be wondered at that the yield, under these circumstances, is very small per cow—averaging about 2 quarts a day—and the period of lactation running for only five or six months. Near Buenos

Ayres, where the bulk of the dairying is carried on, the quantity given by each cow is the highest, but the test is only 3 per cent. Further south, in the hilly country, and across the river in the province of Entre Rios, the quantity yielded is smaller, but the test higher—about 4 per cent. on an average. The variation is accounted for by the different pastures indigenous to each locality. Where hand feeding is resorted to, alfalfa (lucerne) is mostly used, for the growth of which enormous areas are cultivated. An average price to pay for milk is about 2½d. a gallon; many dairymen ocntract with a creamery to supply all the year round at this price, the buyer inserting a clause in the contract giving him the power to reject all milk testing below 3 per cent.

Skim Milk.—After the cream has been separated, the skim milk is run into vats, and manufactured into casein, for which ready sale is found in England for the manufacture of knife handles, buttons, &c.

Casein.—In 1904, dried casein was fetching £30 a ton in London; in 1906, it dropped to about £20, but it has since gone up again in value. There are several casein companies in the Argentine, with central mills in Buenos Ayres. They buy all the skim milk from a creamery, for, say three years, giving about a farthing a gallon for it; manufacturing the casein at their own expense. It takes about 7,500 gallons of milk to make one ton of casein. This works out at somewhere near a penny per gallon realised for skim milk, with the price for casein at £30 per ton. Deducting freights, commission, &c., leaves about three-fifths of a penny per gallon as the net value of skim milk. The whey, after the casein is extracted, is given to pigs, who do well on it. The plant required for the manufacture of casein is very cheap; the chief items of expense are a press, and a drying room fitted with boiler and steam radiator, for use in wet weather. In fine weather the sun's rays do all the drying. The system of manufacture is simple, but it would take too long to give all details here. The Argentino does not require his skim milk for raising calves, and he can utilise the whey residue of the casein for his pigs—when he keeps any. Prior to the introduction of casein factories, the bulk of the skim milk was thrown away.

Measuring, Sampling, Testing.—Milk is not weighed, but is poured into a small measuring vat placed on the receiving platform—graduated to 5 litre marks.

Testing is done by either Gerber or Babcock machines. Most of the factories take daily tests; others are satisfied with a composite sample tested every week. One central butter factory, which owns some fifty creameries, has samples taken daily at all its stations. These are forwarded by rail, under lock and key, to the head factory, where two samples are taken for a check: one to be tested straight away, the other placed in a flask, and a composite test taken at the end of the week. Skim milk, butter-milk, and cream tests are all checked in the same way. Cream samples are also weighed. I do not know of a single factory that measures the sample for testing, as we do in New South Wales.

Butter Factories.—Butter factory installations are quite up-to-date, and provided with power—both steam and freezing—greatly in excess of present requirements. La Union Argentina, a co-operative company, has the largest factory in the country. Its output during the height of the season has totalled over 20 tons a day. It has plant and power sufficient to treat 50 tons a day, and its cold rooms can store 20,000 boxes. They also have equipped and manned carpentering, tinsmithing, and fitting shops. They keep a qualified analytical chemist to analyse all their butter for water, boric, &c.

Boxes.—The boxes used are of the Australian shape and size, made from Canadian white wood. These are put together and embossed at the factories. The Canadian wood does not make such a good box as the New Zealand pine; the strips are only 6 inches wide, and nails do not hold well in such soft timber.

Cream Cans.—The factories are under very heavy expense in having to supply these free to all cream suppliers. This general custom necessitates a big outlay, for which no return is got; and you can depend on it, the dairy farmer does not take great care of the cans he uses, and they often have to be renewed.

Churns.—The churns used are mostly the box concussion—similar to Cherry's make—and the barrel churn and worker combined. With the latter, the butter is salted and worked in the churn. Those who use it speak highly in its favour. I do not think it is known in this State.

Marketing.—The commission agent is not at all evident. The whole output is controlled by about six factories, who do their own marketing, both local and export.

Fuel.—The question of fuel is a serious one in the country; no wood is obtainable, so coal has to be used. This is imported from England, and, in cases where the factory is inland, the cost is very high, reaching to over £2 a ton. This accounts for the majority of the factories being centred in the capital, near the shipping.

Labour.—In South America, labour is very cheap and plentiful—drawn from all countries under the sun. I paid for ordinary workers £2 10s. and £3 a month; butter-makers, £5 to £10; managers of creameries, £6 to £9. One or two creamery managers, in charge of stations handling 5,000 to 7,000 gallons of milk a day, received £13 to £14 per month. Butter factory managers range from £15 a month to £1,000 per annum in one case.

Quantity of Exports.—The quantities exported during the past five years show a decrease of about 44 per cent. In 1903, 5,700 tons were sent away; for the year just passed only 3,200 tons; a decrease of 2,500 tons.

Quality.—The quality, on the whole, is very good; the percentage of superfine would be higher than with us. This is accounted for by—

(1) the cream coming in the most part from large separating stations, and delivered daily to the factories; and also

(2) the bulk of the cream is cooled and aerated immediately it is separated, and before being put in the cans.

Local Sales.—The local sales amount to about 2,000 tons per annum. This is all unsalted.

Prospects of Increase in Exports.—I do not think an increase in the Argentine exports can be looked forward to, unless they change their methods on the dairy farms, and run them for the production of milk first, and make everything else secondary to that; and until such time Australia has no cause to fear the competition of its Argentine rival. Under the present system, it does not pay to milk cows, and, if things keep on as they are, in a few years, the exportable surplus will have vanished, only enough being produced to supply local requirements.

"The Daily Telegraph" Farrer Scholarship.

The following Regulations to be observed in connection with the above Scholarship:—

1. The first examination will be held in December, 1908, and will be open for all First Year Students of the Wagga Farm School, and the second in December, 1909, open for similar Students of the Bathurst Farm School; and so on in alternate years.
2. Candidates are to present themselves for a written and *vivâ voce* examination on "The Cultivation of Wheat in New South Wales."
3. Candidates are, at time of examination, to submit a paper which has been prepared during their residence at the Farm, on Plant Breeding and results of observations amongst the Stud and Crossbred Wheats which grew at the Farm during their residence.
4. The Scholarship will be awarded only on the understanding that the holder will use it for the payment of his fees for a Second Year's training at either the Wagga or Bathurst Farm School, and on a Certificate of Good Conduct and aptitude for Agricultural work from the Farm Manager.
5. In the event of the fees for that training being more than the amount of the Scholarship now offered, the Department will forego that excess, in order that the scholar may enjoy the whole year's education free.
6. The Government Wheat Experimentalist shall be the sole examiner; and the Scholarship will be awarded by the Minister for Agriculture after consideration of his report.

H. C. L. ANDERSON,
Under Secretary.

Mummy Wheat.

GEO. L. SUTTON,
Wheat Experimentalist.

STATEMENTS regarding mummy or miracle wheat have been revived, and have appeared in a section of the country Press. As these statments may mislead some to whom this variety is not known and induce them to consider the advisability of planting it, the following details regarding it are of interest:—

"Mummy" or "Miracle" wheat belongs to a group of wheats known as Poulard, Turgid, or Rivet wheats (botanical name of which is *Triticum turgidum*), to which also belong the better-known "Australian Poulard," and "Galland's Hybrid." Many of this family have the habit of producing compound or divided ears, and because of this habit they are called "Miracle" or wonderful wheats, so that the name "Miracle" is not confined to one variety, but is given to any variety of this class having divided or branching ears; this habit of producing compound ears is likely to lead the person not familiar with these varieties to believe that extraordinary yields would be obtained from them, but they are by no means prolific, and only yield in a very moderate manner.

Their value for milling is low, the flour being rich in starch, and poor in gluten, dark and unsuitable for bread-making, except when mixed with much "stronger" flour.

This group of wheats is by no means new to Australia. Under the names of "Young's Bearded," "Hen and Chickens," "Mummy," "Miracle," and "Egyptian," different varieties have been growing in this country since the early days of wheat-growing.

Some of these varieties are rust-resisting, one of them under the general name "Egyptian," because of its rust-resisting character, was fairly generally grown on the east coast, just after the prevalence of rust made the cultivation of common bread wheats impossible in those districts.

One of the varieties of this group was called "Mummy," because the single grain from which this particular variety originated was said to have been taken from the wrappings of an Egyptian mummy, and was reputed to be several thousand years old. There is not likely to be any truth in such a statement, because the wheat grain, if still sound after such a lengthy period, would most probably, have lost its vitality. Wheats of this class have been grown in Egypt from very early times, and are still grown there (hence the name "Egyptian" applied to some of them), and this tale probably originated in the fertile mind of some tourists' guide who was anxious to relate something wonderful, and who wished to impress the recipient with the great and unique value of the grain he was receiving. Colour to this probable view is given by the fact that similar stories are related about grains of maize, which is known to be a modern grain, and one unknown to the ancients.

Imports and Exports of Poultry and Eggs, 1907.

COMMONWEALTH OF AUSTRALIA—STATE OF NEW SOUTH WALES.

THE Minister for Agriculture is in receipt of tabulated returns from the Acting Collector of Customs, Sydney, showing the imports, inter-State transfers, and exports into and from New South Wales of live poultry, frozen poultry, and eggs during the year 1907, as follow:—

RETURN showing the imports and inter-State transfers into New South Wales of live poultry, frozen poultry, and eggs during the year 1907.

From whence Imported.	Live Poultry.		Frozen Poultry.		Eggs.	
	No.	£	lb.	£	Doz.	£
Victoria	1,749	176	26,006	826	11,993	535
Queensland	802	81	4,108	146	204,771	6,573
South Australia	56,420	5,679	...	...	1,167,000	41,806
West Australia...	21	12	...	..	.. ...	...
Tasmania	274	29	..	...	......	...
United Kingdom	41	181	108	10	9,384	251
New Zealand	55	47	...	...	4	2
Germany		...	...	...	3,213	60
Hong Kong	...	...	...	...	4,521	124
Norfolk Island	2	1	.	...	......	...
United States	13	22	..	...	......	...
Japan	4	4	...	...	157	4
Total	59,381	6,232	30,222	982	1,401,043	49,355

RETURN showing the export of live poultry, frozen poultry, and eggs from New South Wales during the year ended 31st December, 1907.

Destination.	Live Poultry.		Frozen Poultry.		Eggs.	
	No.	£	Pairs.	£	Doz.	£
New Zealand	427	482	..	...	5,110	392
United Kingdom	626	94	...	...	30	1
Canada	...	...	...	..	196	10
Cape Colony	...	...	242	227	......	...
Fanning Island...	...	...	22	2	......	...
Fiji	354	102	...	...	468	26
Hong Kong	...	...	12	2	.. ...	...
Natal	...	...	3,116	620	......	...
New Guinea	118	19	...	...	70	5
Norfolk Island	20	3	...	...	......	..
Ocean Island	108	20	...	..	506	33
Straits Settlements	..	...	674	234	....	...
Caroline Islands	10	5	...	...	......	..
Cochin China	18	8	...	...	......	...
Japan	28	39	12	10	......	...
Java	...	...	4	2	... ..	...
Kaiser Wilhelm's Land	31	8	..	..	......	...
Marshall Islands	209	45	...	...	460	27
Neu Pommern	407	86	...	...	891	59
New Caledonia...	5	4	...	...	.....	...
New Hebrides	63	19	...	...	... ..	...
Phillipine Islands	13	7	1,808	1,166	......	...
South Sea Islands	205	61	16	3	1,146	65
Hawaiian Islands	9	15	...	...	.. ...	..
Vladivostock	120	46	12	3	.. ...	...
Ceylon	...	...	108	22	.. ...	...
Total	2,771	1,063	6,026	2,291	8,877	618

For returns for year 1906, see *Gazette*, May, 1907.

A Native Bird destroying the Sparrow.

C. T. MUSSON,
Hawkesbury Agricultural College.

In the *Lachlander and Condobolin District Recorder*, 26th February, 1908 (sent by Mr. G. L. Sutton, with paragraph marked), the following statement appeared :—

> Mr. A. J. Taylor, of Wheatacre, informs us that during the past few months he has noticed the presence of numbers of large birds, blue in colour, with black heads, which are very destructive to sparrows. In fact since the arrival of these aerial cannibals, sparrows are practically an unknown quantity about Wheatacre.

We wrote Mr. Taylor for further information, and received the following reply :—"*Re* the bird that takes the sparrows, it is quite true there is not a sparrow left about the place, and there were hundreds here. I tried in every way to get rid of them, but since those birds came we got rid of them. We never saw the birds before; they are strangers. There are about four of them in a flock, and they keep together. I do not think it is a hawk, though they balance in the air like a hawk. They keep after the grasshoppers, but they are death on the sparrows. The other birds are not frightened of them. They are very quick on the wing, and, when flying, spread out the tail."

Three days later came a specimen for identification: it is the Ground Cuckoo-Shrike (*Pteropodocys phasianella*). The head and neck are dark-grey; breast and lower back dull white crossed by narrow black bars; wings, upper side black; under side white; tail forked; the terminal half black. It is about the size of a small pigeon, but more slender; total length from tip of bill to end of tail, 14 inches. Commonly, they make use of their legs a good deal, not flying much. Insects are the chief food, and we do not hear of them doing any damage.

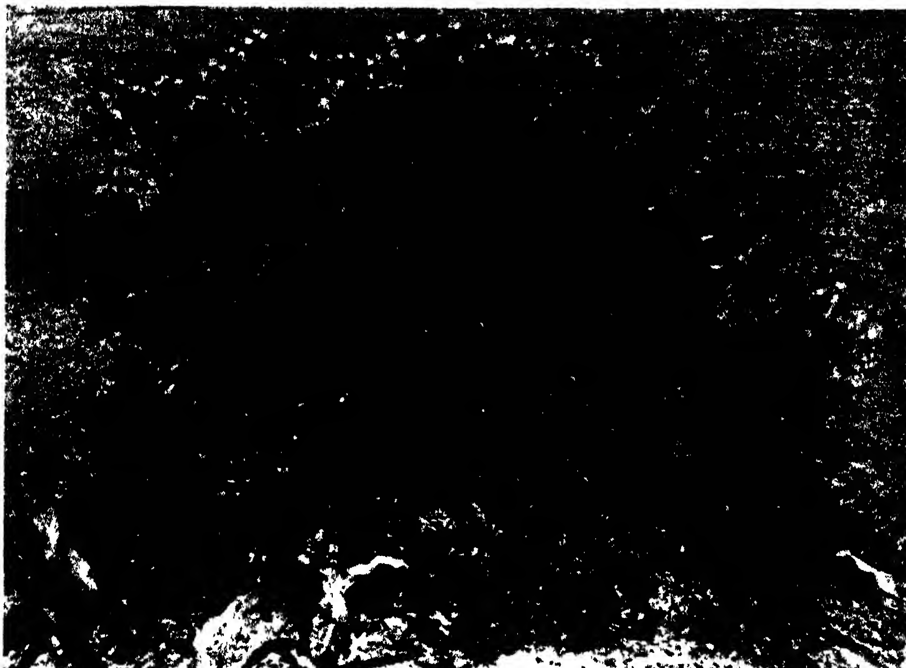
This is a most interesting fact, which should be noted by all dwellers west of the range where the bird is found. If this is to become a fixed habit, which probably it now will, it would appear that the sparrow has at least one enemy in its new abode. Sportsmen should take note and act up to the fact stated. Nature would here seem to be coming in, for evidently the cheeky little interloper is no longer to have such a peaceful time as it has had in the past. The "balance is beginning to kick," and we may congratulate ourselves that at least one cause is in operation which will help in bringing the sparrow down in numbers to such reasonable limits as will preserve a due balance of life forms, and not allow this particular bird to become unduly plentiful.

Goat's Rue (*Galega officinalis*)

AT BATHURST EXPERIMENT FARM.

R. W. PEACOCK.

THIS is a hardy herbaceous leguminous plant, which grows to the height of 5 feet. It is written of favourably as a forage plant. The generic name *Galega* is derived from *gala*, milk; the herbage being supposed to be superior for milking cows, goats, &c.



Goat's Rue.

It thrives exceptionally well under good cultivation. Its vigorous root system enables it to withstand considerable dry weather. It also withstands many degrees of frost, making some growth throughout the winter at this farm.

Where it does not receive attention the hardiest weeds crowd it out.

Apparently stock must acquire a liking for it. When fed to cattle at this farm they would not eat it. Sheep were turned upon it, but would have none of it. Stray plants grew in the pig paddock where the pigs had free access, and it was not eaten by them. One old horse seemed to relish it. It has every appearance of an excellent fodder plant.

Stock not so well fed as those on this farm may be taught to eat it.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 96. *Chloris divaricata*, R.Br.

Botanical Name.—*Chloris*, the Greek word for "pale green," in allusion to the colour of some of the members of this genus; *divaricata*, Latin, literally "straddling" or spread asunder, hence very divergent. This refers to the spikes of flowers.

Brown uses the word in his original description when he says "spicis 6–9 digitatis divaricatis."

Vernacular Name.—I know of none.

Botanical Description.—A glabrous erect tufted grass of 1 to 2 feet.

Leaves narrow, flat or convolute, the sheaths often much flattened.

Spikes 6 to 12, slender, 3 to 6 inches long.

Spikelets very numerous but not crowded, rarely 2 lines long without the awns.

Outer glumes unequal, very narrow, finely pointed.

Flowering glume narrow, keeled, 3-nerved, the fine awn 3 to 6 lines long, with a point or narrow lobe on each side.

Terminal empty glume broadly linear, 2 lobed, with an awn between the lobes sometimes as long as that of the flowering glume. (B.Fl. vii, 612.)

NOTE.—(1) The leaf-sheath appears to be more flattened in this than in any other species. (2) Comparing this with the closely related *C. acicularis*: in that species the flowering glume tapers into the awn, while in *C. divaricata* the flowering glume has an acute tooth or lobe on each side of the awn.

Value as a fodder.—Like most other species of *Chloris* it is, probably, a valuable pasture grass for sheep, more particularly before its flower-spikes become ripened, but we have few detailed observations by pastoralists concerning it.

Habitat and Range.—Collected at Yandama, north-western New South Wales, by Mr. A. W. Mullen, Surveyor for the Western Lands Board, April, 1906. It has since been received from the Moree district from Mr. C. J. McFarland. It has, probably, been passed over as other species, and will, probably, be found to have a wide range in this State.

This interior grass is recorded in Mueller's "Census" from North Australia and Queensland. Mr. Max Koch, who did good work in the botanical exploration of South Australia, discovered it in 1900 at Mt. Lyndhurst, in that State, and in *Proc. Linn. Soc. N.S.W.*, 1906, p. 740, Mr. Betche and I recorded it as an addition to the flora of New South Wales.

REFERENCE TO PLATE.

1. Entire Plant. Natural size.
2. Part of rhachis of a spike, showing the two persistent outer glumes of two spikelets.
3. A single spikelet, showing—
   - *a. a.* The two persistent outer glumes.
   - *b.* The flowering glume, opened out so as to show palea and grain.
   - *c.* The empty terminal glume.
4. Flowering glume.
5. Flowering glume and empty terminal glume in their natural position as they drop off with the ripe grain, leaving the two outer glumes persistent on the rhachis (2).
6. Grain.

CHLORIS DIVARICATA, R Br

Meteorological Bureau, No. 4 Division, New South Wales.

Weather Conditions during June, 1908.

S. WILSON,
Divisional Officer.

During the first week of the month the pressure systems which passed over Australia were all, more or less, of the winter description, the anticyclones being of such huge dimensions as to cover the whole of the continent, and the antarctic disturbances making their presence felt along the southern seaboard and New Zealand, in the form of cold west to south-west gales and rough seas. The central value of the anticyclones gradually increased until a barometric pressure of 30·7 inches was attained between Adelaide and Robe on the 2nd. The lowest barometer readings on the mainland for that week also occurred on the 2nd, when 29·6 inches was registered at the Leeuwin, in an antarctic disturbance.

The rainfall during the week ended the 6th, was for the most part along the coast, but on the 1st, some scattered light to moderate falls were recorded on the North-west and Central-western Plains, and Central Tableland. On the 3rd the south-east corner benefited to the extent of moderate rainfall.

On the 6th an anticyclone of medium energy covered the whole of the mainland of Australia, with its centre over South Australia and our western districts. As a consequence, fine weather with low temperatures ruled for the most part in the various States, with the exception of a few isolated showers along the seaboard. By the 8th a considerable change had occurred in the distribution of pressure. The anticyclone had travelled eastward, and now covered only the eastern States, with its centre over New South Wales and Victoria. The advance portion of another "high" appeared in West Australia, between Geraldton and Perth, whilst between them were shown two depressions, an antarctic, between Albany, Charlotte Waters, and Adelaide, and a monsoonal over North-west Australia.

The presence of the centre of the anticyclone over New South Wales and Victoria was responsible for very cold weather in various parts of these two States, especially in the south-eastern corner and highland districts of New South Wales. As the result of the influence of the antarctic disturbance, light rain was recorded along the Darling, and at isolated places in the north-west of New South Wales. as also light to moderate falls at many places on the shores of the Great Australian Bight, on the southern gold-fields, and on the west coast of West Australia. In the north-west quadrant of the latter State some light to heavy falls were recorded, as the effect of the monsoonal disturbance there. The heaviest reported amounts were 328 points at Cossack, and 164 points at Condon.

During the following twenty-four hours the "high" over Eastern Australia had worked in a north-easterly direction, its centre at 9 a.m. on the 9th

being situated in the vicinity of Brisbane. The other pressure systems had also advanced eastward, the disturbance causing beneficial rainfall over the southern districts of New South Wales, and over northern parts west from the slopes. The heaviest falls were 95 points each at Wentworth and Euston, 94 each at Moulamein and Albury, 91 at Deniliquin, 88 each at Tocumwal and Conargo, 85 at Jerilderie, 80 at Corowa, 79 at Whitton and Henty, 75 at Urana, and 73 each at Coolamon and Tarcutta. Good consistent rainfall was also recorded in South Australia; and rough seas prevailed along the southern shores of the continent from the Leeuwin to Streaky Bay.

By the 10th the disturbance had become the dominating weather system over an area south from lines joining Eyre, in the Great Bight, Windorah (Queensland), and Newcastle, and still further good rains were experienced over New South Wales and South Australia, and at scattered places in Victoria and Tasmania. The rain area in our State had expanded eastward over the highlands to scattered places on the coast, the heaviest amounts being 154 points at Bendemeer, 150 at Nundle, 132 at Uralla, 137 at Narrabri, 135 at Walcha, Bundarra, and Coonabarabran, 129 at Warialda, 131 at Murrurundi, 125 at Yetman, 121 at Emmaville, 120 at Inverell; as also many falls over 100 points.

At 9 a.m. on the 11th, the antarctic disturbance was shown to have contracted somewhat towards the east, but still persisted over the south-eastern States, resulting in more light to moderate rainfall, and fresh to strong north-west to south-west winds. During the 12th the anticyclone, which during the previous few days was situated over the western half of the continent, assumed a very elongated shape, extending from the western coast to Russell, in New Zealand; and the isobars of the antarctic disturbance arranged themselves horizontally between Streaky Bay, Newcastle, and Gisborne (New Zealand), on its northern limits, and between the Bluff (New Zealand) and Hythe (Tasmania), to the south, influencing the continuation of the west to north-west element in the winds; as also more rainfall over southern portions of New South Wales and South Australia, and in Victoria and Tasmania.

On the 13th, the incipient high pressure covered the whole of Australia, excepting in the south-east and south-west corners, where the northern isobars of a very extensive antarctic disturbance were shown. As the result of this distribution, northerly winds obtained for the most part over southern districts of Australia, with rough to high seas in Bass Straits, and on the western coast of Tasmania. In the interior fine weather ruled, but scattered showers were recorded on the southern seaboard between Fowler's Bay and Gabo, as also in Tasmania and coastal and tableland districts of New South Wales.

By 9 a.m. on the 15th the high pressure had travelled south-eastward, and occupied only the eastern half of the continent, but it had gained considerably in energy, its centre—30·4 inches—being now over Tasmania and eastern districts of New South Wales and Victoria. As the result of this southerly

movement of the anticyclone, the antarctic disturbance was dislodged from the south-eastern corner. The other portion of the depression in the south-west, however, showed intensification, and an expansion eastward as far as Eucla. Fine weather resulted for the most part in the area occupied by the high pressure, excepting along the coast of our State, where light to heavy rainfall was recorded. Light falls were reported also from south-western districts of West Australia, and along the southern seaboard; moderate to rough seas occurred between Cape Borda and the Leeuwin. The heaviest rainfall was reported from scattered places along the coast of New South Wales. Byron Bay had 116 points, Port Stephens 75, and Moruya Heads 72 points.

During the following twenty-four hours little or no forward movement was shown in any of the pressure systems overlying Australia, but the "high" over the eastern half had gained another tenth of an inch in its central value. Further light to moderately heavy rain occurred along coastal districts of our State, and the southern shores and south-west corner of the continent. Heavy seas still persisted on the south coast of West Australia.

At 9 a.m. on the 17th the anticyclone was again shown over the eastern half of Australia, but its centre had passed off the mainland to the Tasman Sea. The depression occupied a portion of the Southern Ocean, between Cape Borda and the Leeuwin, and an advancing high pressure over West Australia. With this distribution of atmospheric pressure, fine weather obtained over the area under anticyclonic control; but over southern districts of West Australia, and along the southern seaboard of the continent, light rainfall for the most part was recorded, and an isolated heavy fall of 100 points occurred at Albany. Strong north-west to south-west winds, with slight to rough seas, also occurred between Cape Northumberland and the Leeuwin, as the result of the influence of the antarctic disturbance.

The isobaric chart of the following day showed that the eastern high pressure was gradually losing energy on the mainland, and moving north-eastward. The disturbance had also advanced as far as the western coast of Tasmania, but as yet only one isobar was in evidence. The frontal isobars of the West Australian anticyclone had extended as far as William Creek and Alice Springs, its central value being increased by more than one-tenth of an inch. Light rain still persisted along the southern seaboard, but otherwise, excepting for cloud areas in the south-eastern States, fine weather prevailed.

By the 19th a great change had occurred in pressure distribution over the eastern half of Australia, for at 9 a.m. the anticyclone there was over the seaboard districts of Queensland, its north-easterly movement giving inducement to the extension northward of the antarctic disturbance, whose lowest readings were shown in Southern Tasmania. The western high-pressure had also extended further eastward.

During the week ended the 19th splendid rains were experienced over the greater part of the south-eastern States. In New South Wales the falls ranged between 30 points and 100 points, and the lowest temperatures recorded

were 8 degrees at Kiandra, on the Southern Tableland; 24 degrees at Coonabarabran, on the Central-western Slope; and 25 degrees at Armidale, on the Northern Tableland.

At 9 a.m. on the 20th an extensive high-pressure system covered practically the whole mainland of Australia, excepting a narrow stretch of country south of a line joining Sydney and Perth (Western Australia). This latter portion was occupied by the northern isobars of an antarctic disturbance, with its lowest barometric readings on the east coast of Tasmania. With this distribution light to heavy rainfall occurred at scattered places in the area dominated by the depression, with moderate to rough seas between the Leeuwin and Wilson's Promontory. The heaviest falls were 120 points at Robe and 104 at Cape Borda. Light to heavy rainfall was also recorded generally in the southern districts of our State west from the tablelands, the largest amounts being 88 points at Kiandra, 75 at Albury, 53 at Corowa, and 56 at Tumberumba.

Within the next forty-eight hours a great change was shown in pressure distribution, for the "high" had tilted north-eastward, so that its advance portion at 9 a.m. on the 22nd covered Central Queensland. This northward movement was attended by an expansion of the antarctic disturbance over the whole of the south-eastern States, which resulted in unsettled to showery weather over many districts. In New South Wales the rain was chiefly confined to the area south of the Lachlan, with snow on parts of the central and southern highlands. Victoria reported moderate to heavy falls almost throughout, but only light in the south-east. In South Australia general rains were recorded; light between Port Augusta and Farina, and moderate to flood falls in the far north. The heaviest reported amounts were 170 points at Cape Borda, 157 at Adelaide, 95 at Fowler's Bay, 85 at Wallaroo, and 67 at Eucla. In our State, an isolated heavy fall of 112 points, the result of melted snow, was recorded. Hail was also associated with the rainfall in this disturbance. Strong west to southerly winds, with rough to high seas, were experienced along the seaboard between Lincoln and Wilson's Promontory.

At 9 a.m. on the 23rd the advance isobars of the anticyclone were shown to have expanded south-eastward as far as the western districts of our State, thus compressing the disturbance into a smaller area. As a consequence, the barometric gradients became steeper, causing fresh to strong south-west to westerly gales over Victoria, Tasmania, and our south-eastern quadrant, as also a continuation of the rough seas between Cape Otway and Gabo. Still further rainfall occurred over the greater portion of the south-eastern States, with more snow on the highlands. Within the following twenty-four hours the high-pressure had covered the whole of the continent, excepting the south-eastern seaboard, where the rear isobar of the disturbance still lingered, its central value, 29·2 inches, being now shown at the Bluff (New Zealand).

Very cold and frosty conditions occurred in various parts of the States, and fresh to strong westerly winds were still reported from the south coast

of New South Wales. On the 25th, at 9 a.m., the anticyclone became the chief weather control of Australia. During the previous twenty-four hours its centre had advanced about 800 miles eastward, and now covered South Australia and the greater part of New South Wales. As the result of its influence fine weather ruled over the entire continent, excepting for cloud-areas at very scattered places inland and in the south-west corner, where the advance portion of another antarctic disturbance had appeared, resulting in cloudy to showery weather there. Many frosts occurred on the highlands and inland districts of New South Wales, Victoria, and South Australia, but otherwise weather was fine generally. At 9 a.m. it was snowing at Orange and Murrurundi.

The isobaric chart of the 26th showed a contraction in the main body of the high-pressure, and a slight increase in central barometric value, but very little forward movement had taken place. The influence of the depression, however, had extended all along the western seaboard districts of West Australia, and resulted in some substantial rainfall there. The heaviest falls were 313 points at Carnarvon, 100 at Hamelin Pool, 76 at Geraldton, and 67 at Bunbury.

In South Australia, as the effect of the presence there of the centre of the anticyclone, the weather was generally fine and cold, with severe frosts.

The lowest temperatures registered in New South Wales between the 20th and 26th inclusive were :—In Western Division, 25 degrees at Mungindi, Bourke, Balranald, and White Cliffs respectively. On North-western Plain, 25 degrees at Collarendabri, Moree, and Walgett respectively. Central-western Plain, 18 degrees at Carinda, Riverina ; 26 degrees at Hay. North-western Slope, 20 degrees at Bingara and Warialda respectively. Central-western Slope, 22 degrees at Coonabarabran. South-western Slope, 23 degrees at Junee. Northern Tablelands, 18 degrees at Inverell. Central Tablelands, 21 degrees at Mudgee. Southern Tablelands, 10 degrees at Kiandra. North Coast, 29 degrees at Casino, Hunter, and Manning ; 27 degrees at Newcastle. Metropolitan, 28 degrees at Parramatta. South Coast, 26 degrees at Bowral.

On the 27th the antarctic disturbance was responsible for further rainfall in West Australia ; the heaviest reported amounts were 110 points at Winning Pool and 75 at Bunbury, and within the next forty-eight hours fresh to strong winds, rough to high seas, and rain squalls with hail, occurred along the South Coast. By the 30th the unsettled weather conditions had extended as far eastward as Jervis Bay, and thus covered all the southern seaboard districts of the continent.

During June, the total rainfalls in the various subdivisions of the State were for the most part below the average. Indeed, over three-fourths of New South Wales had amounts which were discrepant. Some very dry tracts are shown on the monthly chart, more especially on the Central and Southern Tablelands and Coastal districts. Within the area bounded by lines joining Nowra, Mt. Victoria, and Wyong, little or no rainfall was experienced, Windsor and Nowra having had none whatever, and at other stations falls

ranging between 3 points and 43 points. On the other hand, Riverina, the South-western Slope, and the southern border of Western Division, have experienced amounts which were above the average.

As compared with June of last year, the rainfall of the month just ended presents some interesting features, for whereas Riverina and the South-western Slope last month were practically the only divisions with falls above average, the chart of June, 1907, shows that those two regions for the most part were the only places with rainfall below normal. In most of the other subdivisions of the State, June, 1907, proved a splendid month as regards rainfall.

Perhaps the greatest contrasts in amounts are shown in and around the Metropolitan area. At Sydney, in June, 1907, 914 points were registered as against only 94 points last month; Parramatta, 412 against 21 points; Kurrajong, 439 against 18 points; Windsor, 362 against nil; Camden, 201 against 3 points; and Picton, 249 against 22 points.

The largest amounts in each of the subdivisions of the State during June, 1907 and 1908, are shown hereunder:—

	1907.			1908.		
North Coast	1,239	points at	Byron Bay ...	121	points at	Byron Bay.
Hunter and Manning	1,024	,,	Port Stephens...	280	,,	Seal Rocks.
Metropolitan	914	,,	Sydney... ...	94	,,	Sydney.
South Coast	881	,,	Kiama	216	,,	Jervis Bay.
Northern Tableland ..	390	,,	Walcha... ...	212	,,	Uralla.
Central Tableland ...	554	,,	Katoomba ...	301	,,	Carcoar.
Southern Tableland .	444	,,	Araluen ...	647	,,	Kiandra.
North-western Slope	410	,,	Quirindi ...	256	,,	Nundle.
Central-western Slope	292	,,	Molong... ...	190	,,	Coonabarabran.
South-western Slope	322	,,	Burrowa ...	658	,,	Tumberumba.
North-western Plain	183	,,	Wee Waa ...	416	,,	Boomi.
Central-western Plain	170	,,	Ungarie ...	149	,,	Ungarie.
Riverina	250	,,	Corowa	385	,,	Henty.
Western Division ...	235	,,	Menindie ...	187	,,	Euston.

During the month some very low temperatures were registered in each of the subdivisions, the absolute lowest being experienced at Kiandra, with 2 degrees, or 30 degrees of frost.

At Sydney the mean temperature 51·3 was 3 degrees below average, and the extreme minimum, 39·1 degrees, registered on the 25th, was only 1 degree less than the absolute lowest during the past 49 years, recorded on 29th June, 1862.

The distribution of rainfall over the various subdivisions of the State during June, 1908, was as follows:—

		Departure from normal. Points. Above.		Below.
North Coast	from	—		250 to 505
Hunter and Manning	,,	—		77 to 456
Metropolitan	,,	—		328 to 439
South Coast	,,	—		236 to 486
Northern Tableland	,,	—		11 to 209
Central Tableland	,,	—		49 to 519
Southern Tableland	,,	—		45 to 333
North-western Slope	,,	—		14 to 109
Central-western Slope	,,	—		28 to 134
South-western Slope	,,	152	to	77
North-western Plain	,,	—		48 to 111
Central-western Plain	,,	—		14 to 144
Riverina	,,	9 to 107		—
Western Division	,,	47	to	148

Comparison with India.

The following is a statement showing a brief comparison of the chief meteorological elements of India, together with those of Australia as far as data are available, during the month of June, 1908:—

	Departure from normal.		Weather Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	inches.	degrees.	
Simla (India) ...	- ·01	+ 2·3	Rainfall defect.
Sydney (N.S.W.) ...	+ ·02	- 3·0	Above normal in Riverina and on South-western Slope, elsewhere below.
Melbourne (Victoria)	- ·03	- 2·8	Rain above average generally except in the south-east.
Adelaide (S.A.) ...	+ ·01	- 3·5	Below normal in north and east, elsewhere above; heavy on seaboard and Mount Lofty Ranges.
Perth (W.A.) ...	0·0	- 3·4	Below in Kimberley District, elsewhere generally above.

Judging from the above table, the mean temperatures of the Australian cities during last month were considerably below normal, whilst in India they were more than 2 degrees higher than the average; also in both India and Australia barometric pressure showed very little departure from the usual experience.

The rainfall in India during June has again been below the average, whilst in the several Australian States, for the most part, amounts above normal have been experienced. New South Wales fared worst, having only Riverina and the South-western Slopes above average.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for June, 1908.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture (Saturation = 100).			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	% of the year's Evaporation.
29·66 22	30·48 16	30·09	23·2 28	70·6 1	47·75	51·189	47 7·14	95 18	68	·122 24	2·151	1·861	4

Rainfall ... { Points ... 4, 1 / Dates ... 11, 20 } = 5 points.

Mean rainfall for 16 years, 2·08 inches.

Wind ...	N	NE	E	S	SW	W	NW
	1	8	1	2	8	6	3

Greatest daily range of temperature, 38·2° on 28th.

Extremes of rainfall for month ... { 0·05 inches ... 1908. / 5·730 ,, ... 1896. }

Frost on 2nd to 9th, 14th, 15th, 18th, 21st, 22nd, 24th, 25th, 26th, 28th, 29th, 30th.

Remarks:—A cold, frosty, dry month. The lowest monthly rainfall recorded at the College.

W. MERVYN CARNE,
Observer.

Orchard Notes.

W. J. ALLEN.

AUGUST.

Almonds.—The nuts which bring the highest prices in the Californian market are the Nonpareil, which stand at the top, followed by I.X.L. and Ne Plus Ultra respectively. One of the varieties coming into prominence is the Texas Prolific, which is rather a round-shaped nut, blooms late, and is a prolific bearer. The tree is an upright, strong grower. Mr. J. P. Dargity, who is a large almond-grower in California, speaks very highly of this latter variety. G. C. Roeding places the Jordan as the best hard shell almond growing in California.

Number of trees or plants to the acre.—Square method: Multiply the distance in feet between the rows by the distance the trees are apart in the rows, and the result will be the number of square feet for each plant or tree, which, divided into 43,560 feet (the number of feet in an acre), will give the number of trees to an acre.

Distance apart.	Number of Trees and Plants.	Distance apart.	Number of Trees and Plants.	Distance apart.	Number of Trees and Plants.
1	43,560	9	537	22	90
2	10,890	10	435	24	75
3	4,840	12	302	25	69
4	2,722	14	222	26	64
5	1,742	15	193	28	55
6	1,210	16	170	30	48
7	888	18	134	35	35
8	680	20	108	40	27

Equilateral triangle: Divide the number required to the acre (square method) by ·866, and the result will be the number of trees or plants required to the acre by this method.

The following are some of the trees which should be grown more extensively than they are as shelter belts and wind breaks:—

Kurrajongs.—The Kurrajong is worthy of being planted extensively in all the drier and warmer parts of the State. It is indigenous to Australia and a good standby during droughty years. It is necessary to protect it from the stock for the first few years else they will eat it out, but when once it is established and large enough not to be damaged by the stock there is no more beautiful tree grown. Everybody should plant these trees extensively; in fact there should be millions of them growing where at present there are only hundreds.

Carob Bean is another good shade tree, and the beans are good for feeding to the stock. After grinding them up we feed them to our horses at the Pera Bore orchard.

Oriental Plane is a beautiful shade tree to grow in our more moist and cooler districts. It grows quickly and makes a good shade and wind break during summer months, but being deciduous it loses its leaves in the winter.

Grevillea Robusta is another indigenous tree, and is well worth a place as an ornamental tree.

Sugar Gums, although great robbers, make a good quick-growing wind break.

The *Pepper-tree* does well in most of the warm districts of the State, is a quick grower, and makes a good shelter for stock, but it is a great robber, and the wood is of little use.

Peach-tree which has been pruned every season since planting—ten years old.

Grafting.—The latter part of this month is a good time to start the grafting of deciduous nursery stock, and should there be any unprofitable apple, pear, or other trees standing in the orchard, these also may be grafted to good varieties. Grape vines are easily grafted just as the buds are well swollen and about to burst. Old peach, plum, and apricot trees will be found much harder to graft than either apple or pear-trees. If, however, there are any such in the orchard which are unprofitable, it would be as well to cut

them back and graft to better varieties; and in the event of the grafts not taking, young shoots might be allowed to grow, and buds inserted either in the summer or fall.

Grafting Wax.—The following are two methods for preparing grafting wax, the first for a rather hard wax and the second for a soft one:—

No. 1.—Take 2 lb. of resin, 2 lb. of beeswax, 1 lb. of mutton tallow. Dissolve over a slow fire and apply warm with a brush. If it is found necessary to apply this with the hands, they should be kept well greased to prevent the wax from sticking to them.

No. 2.—Take 1 lb. of beeswax, 5 lb. of resin, 1 pint of linseed oil, and 1 ounce of lampblack, and mix together. If not soft enough add a little more oil.

Spraying.—Besides the above work, there is the winter spraying with the sulphur and lime solution, which will kill two birds with one stone, being both an insecticide and fungicide. It answers fairly well in keeping in check the curl leaf of the peach-tree; but for this latter disease Bordeaux mixture is even better. Trees treated with either of these solutions will show very little curl.

The sulphur and lime is one of the very best sprays we have for the San José scale; but where trees are badly infested it is better to give two sprayings—one in the fall and another in the spring, just as the leaf buds begin to swell, and before the trees are in bloom.

Peach Aphis.—For peach aphis the resin and soda is a good useful spray, as is also the blue-oil emulsion, but it usually takes several applications to keep this pest in check. Another mode of treatment is to dissolve a cake of Sunlight soap in 2 gallons of water and spray when warm. This is easy to mix, and has given satisfactory results in destroying this pest, and the wash will not injure the blossom, consequently the trees can be sprayed at any time. It is not safe to use other sprays when the trees are in bloom.

Woolly Aphis.—At time of pruning, particularly in young apple orchards, a sharp lookout should be kept for the appearance of Woolly aphis, and should any trees be found infested they should be carefully pruned, removing and burning as many of the infested twigs as possible. Then either scrub the trees thoroughly, using a strong kerosene emulsion, or fumigate with hydrocyanic acid gas, so as to eradicate this pest if possible.

Codling Moth.—All bark should be scraped from apple, pear, and quince-trees, and the scrapings burnt, and everything in the orchard which would be a harbour for codling moth destroyed. Keep all fruit houses as clean as possible, as there is no doubt that they are responsible for harbouring a great many moths every year. Therefore keep the rooms as airtight as possible, and as soon as the moths begin to hatch in the spring, burn sulphur in the rooms once every other day for a fortnight, so that the moths as they begin to fly may be destroyed by the fumes.

Vine Moth.—In working around vines, keep a sharp lookout for the pupæ of the vine moth. If there are any old, partially rotted stakes, the moths will be found adhering to these and also to the old bark which is hanging to the vine. Crush these wherever found and thus assist in keeping down the pest as far as possible.

Commercial Manures.—These may be applied towards the latter end of the month, or in September. In the drier districts, where late rains are uncertain, it is better to make the application early rather than late, as it is

Peach-tree which was pruned the first year after planting only—ten years old.

well known that they do not give the same results if applied when the soil is at all dry. If summer applications are made it is better to make them immediately after a rain, while the ground is quite moist, in order to obtain the best results.

Pruning.—In the illustrations of the two apple trees shown in the last issue of the *Gazette*, it should have been mentioned that the tree shown on page 601 has not been pruned since the first year after planting. As far as the growth of the trunks is concerned it will be noticed that it is very much the same in both the pruned and unpruned specimens.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Condobolin P. and A. Association	G. Bennett ...	Aug. 4, 5
Narandera P. and A. Association	W. T. Lynch ...	,, 5, 6
National A. and I. Association of Queensland ...	C. A. Arvier ...	,, 10 to 15
Forbes P., A., and H. Association	N. A. Read ...	,, 12, 13
Murrumbidgee P. and A. Association	A. F. D. White ...	,, 25, 26, 27
Gunnedah P., A., and H. Association...	M. C. Tweedie ...	Sept. 1, 2, 3
Grenfell P., A., and H. Association	Geo. Cousins ...	,, 2, 3
Parkes P., A., and H. Association	G. W. Seaborne ...	,, 2, 3
Germanton P. and A. Society	J. Stewart ...	,, 2, 3
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 8, 9, 10
Young P. and A. Association	G. S. Whiteman...	,, 8, 9, 10
Cootamundra A., P., H., and I. Association... ...	T. Williams ...	,, 15, 16
Molong P. and A. Association	C. E. Archer ...	,, 16
Cowra P., A., and H. Association	E. A. Field ...	,, 16, 17
Corowa P., A., and H. Association	J. O. Fraser ...	,, 22, 23
Temora P., A., H., and I. Association	John Clark ...	,, 22, 23, 24
Wyalong District P., A., H., and I. Association ...	Thos. A. Smith ...	,, 29, 30
Queanbeyan P. and A. Association	E. O. Hinksman ...	Oct. 1
The Lachlan P. and A. Association	Thos. Cadell ..	,, 29
Adelong P. and A. Association	A. W. Molineaux	,, 13, 14
Lismore A. and I. Society	T. M. Hewitt ...	Nov. 11, 12, 13
Berry Agricultural Association...	A. J. Colley ...	,, 24, 25, 26, 27

1909.

Society.	Secretary.	Date.
Kiama A. Association	R. R. Somerville...	Jan 26, 27
Shoalhaven A. and H. Association, Nowra	Henry Rauch ...	Feb. 10, 11
Kangaroo Valley	E. G. Williams ...	,, 18, 19
Manning River A. and H. Association, Taree ...	S. Whitehead ...	,, 24, 25
Gunning P., A., and I. Society	W. T. Plumb ...	,, 25, 26
Tenterfield P., A., and M.	F. W. Hoskins ...	Mar. 2 to 6
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 10, 11
Gloucester Show	Edward Rye ...	,, 11, 12, 13
Newcastle A., H., and I. Society	C. W. Donnelly ...	,, 11, 12, 13
Inverell P. and A. Association...	J. McIlveen ...	,, 16, 17, 18
Camden A., H., and I. Society	C. A. Thompson ...	,, 17, 18, 19
Blayney A. and P. Association	E. J. Dann ...	,, 23, 24
Yass P. and A. Association	Will Thomson ...	,, 24, 25
Mudgee A. Society	H. Lamerton ...	,, 24, 25, 26
Upper Hunter P. and A. Ass., Muswellbrook ...	J. M. Campbell ...	,, 31 Apl. 1, 2
Bathurst A., H., and P. Association	G. W. Thompson..	Mar. 31 Apl. 1, 2
Durham A. and H. Association, Dungog	C. E. Grant ...	May 5, 6

[1 Plate. 1 Map.]

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VOL. XIX. PART 9. SEPTEMBER 2, 1908.

Agricultural Gazette of New South Wales.

Wheat-growing

ON THE TABLELANDS.

R. W. PEACOCK,
Bathurst Experiment Farm.

Increasing the Average Yield per Acre.

IT is felt that with a better knowledge of the salient points of wheat-farming, the average yield per acre could be materially increased. Assuming that the average cost of producing an average crop of 10 bushels per acre is 25s., this,

Wheat crop, Bathurst Experiment Farm; average yield, 32 bushels per acre. Rainfall for year, 18·26 inches.

at 2s. 6d. per bushel, would but pay expenses, leaving nothing for the grower. By increasing the average yield by 1 bushel, a profit is assured. A farmer should not be satisfied with a 10 bushel crop, but should rather aim at 20. Speculative wheat farming is rife in New South Wales, with its cheap and nasty methods. Many of the largest wheat-growers are realising the necessity of better culture. The methods which induced good results from virgin areas have been found sadly lacking after 10 years of cropping. The novice may deplete a soil of its fertility. It is only the good farmer who can live by his

farm for a lifetime, and hand it to posterity improved by his occupancy. Australian wheat-farming has passed the experimental stage. Facts have been deduced which should assist materially those who are inexperienced in wheat-culture. Australian practice has many aspects peculiarly its own, and many old-world practices have to be modified or discarded if success is to be achieved. Success depends largely upon the ability of the farmer to interpret underlying principles aright, and apply them to his conditions.

The following notes will tersely describe the principal points in wheat-farming; modifications of such must be made to apply to varying conditions. They are more strictly applicable to areas of light rainfalls, to which we must look for the greatest expansion of the wheat area. The attempts to grow wheat in districts of unsuitable rainfall, upon soils not adapted to them, unseasonable seedings, a want of knowledge respecting the peculiarities of varieties, and cultural methods, all tend to reduce the average yield per acre.

Climate.—Wheat will thrive under an extremely wide range of temperatures. Rainfall is an important consideration, especially as regards its distribution. Districts having copious summer rains and high temperatures are unsuitable on account of losses through fungoid diseases, such as rust, and difficulty in harvesting. Districts in which suitable rains fall during autumn, winter, and spring, with comparatively dry summers, are the most suitable. The dry summers allow of cheap methods of harvesting, and losses from diseases and rains are not so frequent. The wheat season requiring rains is practically from first of April till end of November.

Soils.—Wheats prefer good sandy loams rather than rich alluvial deposits, or heavy clays. Rich soils induce too much leaf and stem, which require more moisture than can usually be spared under Australian conditions; such soils are more suitable for the production of hay rather than grain. Light virgin soils are extremely suitable. The richer lands often give better results if cropped a few years before putting under wheat.

Ploughing.—Soils vary to such an extent that it is difficult to prescribe any general method of treatment, and much must be left to the judgment of the farmer. The depth to plough varies considerably. Upon light shallow virgin soils 4 inches may be deep enough the first year. The following year it should be ploughed 1 inch deeper, and this continued until 6 inches is reached. The turning up of too much of the sour subsoil in one operation should always be avoided. The deepening of the mellow sweetened surface should be aimed at. Seven to 8 inches of such retains moisture better, and allows of free root development. A crop should not be sown immediately after deepening the soil by turning up an extra inch of subsoil; such deepening should be left for the fallowing period if fallowing is practised. A good rule is to leave the unsweetened subsoil exposed to the weather at least three months before sowing. Under no consideration should a crop be sown late in the season upon a soil so deepened. The layer into which the seed is placed should be sweet and mellow to ensure a satisfactory early growth. Lighter soils lacking vegetable matter must be deepened with caution, and

organic matter such as stubble or green crops worked in during the process. Heavier soils rich in organic matter on the surface may be deepened quickly to advantage. Too much vegetable matter on top absorbs light rainfalls, keeping them at the surface, and no inducement is offered for the plant to root deeply. Shallow-rooted plants cannot withstand droughts and are dependent upon more continuous rains. It will thus be apparent that deep ploughing would be advantageous consistent with the keeping of a mellow surface. Ploughing should be performed in such a manner as to discourage the growth of weeds. Ploughs which do not invert the surface and cover young growing weeds are faulty and should not be used. Disc ploughs do not cover weeds as effectively as mould-board ploughs. For fallowing, ploughs which present the largest possible surface of the soil to the weathering agents should be used. Smooth fallows also are invariably weedy; rough surfaces should be aimed at. Smooth surfaces readily crust and run together after

Harvesting Wheat after being fed-off.

heavy rains. Rough ones mellow and crumble down during the fallowing period, thereby continually changing the surface, which is desirable. Heavy storms run off smooth surfaces, whereas rough ones trap them. With mould-board ploughs the clods are kept on top when the land is ploughed dry, the finer particles settling beneath. The disc plough carries the fine particles to the top, sprinkling them as an impalpable dust over the surface. Such particles readily crust after heavy rains, and the fine condition of the surface induces the germination of the small seeds of weeds.

Weeds.—Weeds should be attacked vigorously. They are robbers of plant-food and moisture. Heavy yields cannot possibly be obtained where they are abundant. Land should be ploughed as soon as possible after the crop comes off to destroy all weeds which have not matured during the time the wheat occupied the land. By a rational crop rotation weeds are kept in check. Wheat should never be sown amongst a lot of young weeds; the weeds always retain the advantage. The land should be newly ploughed, and the grain sown upon a fresh furrow; stale furrows are unsatisfactory.

Selection of Varieties.—Many farmers sow wheat as though there was only one variety; such cannot be too strongly deprecated. A study of individual varieties is essential. Every farmer should know whether the wheat he sows is an early, mid-season, or late variety; whether it stools freely or sparsely; whether it has a procumbent or erect habit of growth in its early stages; whether the straw is long or short, weak or strong; whether it sheds or holds its grain; whether it is a weak, medium, or strong flour variety; whether suitable for dry conditions; and its behaviour to such diseases as bunt or rust.

Generally speaking, late maturing varieties should be sown first, medium varieties next, and early maturing ones last. It is not wise to have all the eggs in one basket, and depend solely upon one variety. Three well-selected varieties can be made to fit in admirably. It is difficult to forecast any

Wheat lodged, not fed-off.

season. A season may prove suitable except during November, thus favouring early maturing wheats. It may be dry earlier in the spring, and suitable during the early summer, and thus favour later maturing varieties. It may prove exceptionally frosty with a wide range of temperatures, playing havoc with early sown winter-proud varieties of erect habit of growth during the early stages. Moist conditions, accompanied with high temperatures previous to harvest, may induce rust; under such conditions rust-escaping and rust-resistant varieties would prove the best. Strong winds, accompanied by heavy rains when the wheats are heading, may cause weak-strawed varieties to lodge and be placed out of the reach of harvesting machinery. A farmer may sow a wheat for hay, and at harvest find, to his disgust, that it is a variety of very short straw. The choice of suitable varieties for a farmer's own particular conditions calls forth his best powers of thought and observation.

Selection of Seed.—The seed should be of the very best; it should be chosen from the heaviest yielding crop on the farm. The area from which the seed is to be taken should have the very best of treatment. Deterioration is rapid when slipshod methods are followed. Stud seed, or seed that has been carefully selected and not allowed to suffer deterioration for many years, should be used. All seed should be carefully graded to get rid of all second-class grains and weed seeds. It is more profitable to feed the chick-wheat to poultry than to sow it for crop.

Treatment of Seed for Bunt.—Treatment of the seed is necessary to combat stinking smut or bunt. Neglect in this particular may lead to a rejected sample at the mill. The treatment most desired is that which destroys the bunt spores without injuring the vitality of the grain.

Formalin Treatment.—This treatment is performed by immersing the grain for five minutes in a solution made by mixing 1 lb. of formalin of 40 per cent. strength with 400 lb. (40 gallons) of water. One bushel of wheat should be placed in a clean bran bag, immersing the whole of the bag as well to destroy any bunt spores adhering to it. By opening the mouth of the bag, and stirring the grain under water, many bunt balls would rise to the surface, and could be skimmed off together with other impurities light enough to float. After five minutes it should be lifted on to a draining-board, allowing the solution to run back into the cask. By tying the bag at the mouth the bushel of grain could be spread thinly without taking out of the bag and left in a draughty place to dry. It should be dry before putting through the drill; also before broadcasting by hand, unless the land is sufficiently moist to ensure germination. The formalin solution should not be kept longer than one week. It is much wiser to use a fresh solution every time. Grain so treated should be sown within a few days of treatment otherwise the seed-coat may be hardened and germination in some measure prevented. This is the weak spot of the treatment. Very satisfactory results are obtained if the above precautions are taken.

Bluestone Treatment.—The method of dipping is similar in every respect to the above. The solution should be made by disolving 1 lb. of bluestone (sulphate of copper) in from 6 to 8 gallons of water. Bluestone readily dissolves if suspended in a coarse bag near the surface of the water. If of the strength of 1 lb. to 6 gallons the grain should only be immersed until thoroughly wetted and then allowed to drain. If made with 1 lb. to 8 gallons of water, it can be immersed for five minutes, and the stirring and skimming process followed. The thin film of bluestone adhering to the grain has a caustic action upon the young rootlets, and, if the soil is dry may reduce the germination by 50 per cent. Under moist conditions the caustic action is materially reduced. In order to overcome this the grain should be dipped into lime-water after dipping in the bluestone solution. It should be well drained before dipping into lime-water, or otherwise the lime-water will need more frequent renewal. Lime-water is made by placing 1 lb. of quicklime in 30 or 40 gallons of water. The clear solution is then poured off the sediment, and the grain dipped in it. It is wise to renew the solution frequently. One gallon of the above solutions

would treat approximately 1 bushel of wheat. Of course, small quantities require a sufficient number of gallons to insure complete immersion.

Jensen or Hot-water Treatment.—This method is very satisfactory if properly carried out. The disadvantages are the keeping of proper temperatures and the time required. The grain is immersed for 15 minutes in water kept at a temperature of from 130° to 135° Fahr. and afterwards dipped in cold water. Seed containing many bunt balls should be avoided. The bluestone and lime and formalin methods are to be recommended under dry conditions.

Quantity of Seed to sow per Acre.—No hard-and-fast rule can be laid down as to the most desirable quantity to sow per acre. Much depends upon the preparation of the seed-bed, time and method of seeding, variety, size, and quality of the grain, nature of soil and climate, and the freedom of the land from weeds. The seed-beds should be in such condition to allow the seed to be covered uniformly. The soil particles surrounding the grain should be sufficiently fine to ensure moisture being conveyed to the seed from the subsoil. Well prepared seed-beds require less seed than badly prepared ones. Sparse stooling varieties should be sown thicker than prolific stoolers. Early sowings may be thinner than later ones. Poor soils should be sown thicker than rich ones. A bushel of wheat of large grain gives fewer plants per acre than wheats of small grain. Clean land, or land free from weeds, may be sown much thinner than weedy soils; thick seeding may smother weeds if the wheat gets established first. If the climate is dry, wheat should be sown thinly and weeds kept in check by other methods. In moist climates heavier seeding may be practised. Twenty pounds of graded grain of good quality, properly treated for bunt, would be sufficient upon clean land in a climate of low rainfall if drilled in a decent seed-bed at a reasonable time. Thirty pounds would give a maximum result throughout the average wheat districts of fair average rainfall. Farmers must consider the above factors and weigh them in relation to the conditions under and beyond their control.

Methods of Sowing.—Drilling is unquestionably the best method of sowing; it allows of the seed being covered uniformly, the depth regulated, and manure distributed economically with the seed. Such cannot be claimed for broadcasting, either by hand or machine. It is more economical of seed, one-third less being required than by broadcasting. Upon soil that has been fallowed by ploughing thoroughly, the grain may be broadcasted and ploughed under to a depth of 3 inches to advantage. Such ensures uniform covering, and is placed where soil moisture can ensure germination in comparatively dry weather.

Depth to Sow.—The most desirable depth is from 2 to 2½ inches. Under certain circumstances it may be sown deeper in friable soils. Deep-sowing prevents many plantlets reaching the surface. It is not wise to plant deeper than 3 inches in ordinary soils. Two and a half to 3 inches allows of the placing of the grain into the moist soil away from the drying effects of sun and wind. Should heavy rains fall upon deeply-sown wheat before it appears

at the surface, and a crust is formed, a large proportion cannot get through. Under such conditions it should be harrowed. Large wheat grains may be sown deeper than small ones.

Time to Sow.—It is wise to complete the sowings of wheats between 1st April and end of May. Generally speaking, early sowings yield the best crops; late sowings, very often, do not pay expenses. By sowing comparatively early, root development is encouraged before the winter. Soils covered with a fair proportion of leaves and permeated with roots are not so liable to get out of condition by heavy winter rains as soils upon which the wheat has but the first blade. A fair growth also keeps the soil from getting water-logged so readily during the winter months when evaporation is at its lowest. Light sandy soils should be sown early to allow of larger root development to enable the plants to get sufficient plant-food from a soil lacking it. Richer soils may be sown later as the extra plant-food has a forcing action; such soils are warmer, and the growth faster during very

No. 1 unmanured. Plots showing effect of superphosphate. No. 2 manured.

cold weather. If wheats are sown during March they frequently get winter-proud, and should be fed-off by stock, preferably sheep. If wheats are sown after May a judicious application of fertiliser gives a desirable fillip. Different varieties should be sown at different times—see under "Selection of Varieties." In climates of reliable rainfalls till midsummer they may be sown later. Generally speaking, in the wheat districts dry summers are the rule.

Manuring.—It is not premature to state that generally speaking the wheat soils of New South Wales lack phosphoric acid. An application of from 56 to 112 lb. of superphosphate per acre, in conjunction with good culture, invariably increases the yields profitably. Good virgin lands do not require manuring. It is easy to over manure the wheat plant under Australian conditions. A too rank development too frequently exhausts the limited moisture before the grain is matured. A desirable balance between plant-

food and moisture should be aimed at. An application of superphosphate induces a vigorous start and matures the crop about a week earlier than if unmanured, two very desirable effects under certain conditions. Upon very light sandy soils an application of potash may be desirable; this should be ascertained by experiment. Such soils are leachy in districts of heavy rainfall and may respond to an application of nitrogenous manures, such as sulphate of ammonia or nitrate of soda. Mixed manures may be purchased when the requirements of the soil are ascertained by experiment. The majority of our wheat soils have sufficient clay in them to be retentive of potash and nitrates, and are content with phosphates alone, at any rate for a time. The lack of response when nitrogenous manures are used is in contradistinction to English requirements. Such is due to the light rainfall not washing away a portion of the nitrates as they are formed from the soil. Also that nitrates are formed practically throughout the year when the winters are not severe and soil temperatures, during the heat of summer

Rape crop,
Bathurst Experiment Farm.

reduced by cultivation and sufficient moisture conserved. The fact remains that, generally speaking, superphosphates increase the yields profitably, whereas nitrogen and potash do not appreciably increase returns. It is impossible to state how long such will remain the case. Manures require moisture to render them available to plants. Conservation of soil moisture by every possible means should be carried out in conjunction with manuring. When a rotation of crops is followed in conjunction with an occasional bare-fallow, manuring presents very different aspects than when wheat is grown continuously upon the same land.

Fallowing.—In the drier districts fallowing is indispensable to successful wheat-growing. By such, moisture is conserved and the rainfall of one season carried over to supplement that of the next. Fallows are readily permeable by rains. The loose condition of the soil renders it a non-conductor of heat; soil temperatures are thereby kept lower throughout the heat of summer. Australian soils get very hot in summer and the functions of the valuable micro-organisms which liberate plant-food, &c., are suspended Hot soils dissipate moisture. It will thus be seen that fallowing, in keeping the

soil cool, conserves moisture and favours the liberation of plant-food. The organisms which fix the free nitrogen of the air in the soil are also benefited, thus increasing the nitrogen available to the plant. The various organisms are specially stimulated by ploughing under organic matter in the form of crop residues.

Crop-rotation.—In districts of fair average rainfall, fodder crops grown in rotation with wheat possess many advantages. Crops suitable for grazing by sheep are very desirable. Sheep and wheat fit admirably Australian conditions. Continuous cropping with wheat exhausts the soil. Under a rational system of rotation fertility may be increased, manures are more

Ploughing under Rape crop.

economically applied, moisture conserved, and weeds checked. Rape, on account of its value as a sheep-fodder and the residues available to be ploughed under, is an excellent crop in rotation with wheat. Many other crops may be chosen which would suit the various districts. Bare-fallowing should be relied upon in the drier districts.

Feeding-off Crops.—Early sown crops which have made considerable growth during the winter are frequently fed-off by sheep to advantage, if discreetly practised. Crops should not be fed too late in the winter, especially where dry weather during the early part of summer is the rule. Stock should not be turned on in wet weather, especially on soils with a fair proportion of clay in their composition. Continuous grazing for any length of time may be harmful. It is wise to subdivide a paddock if the whole cannot be

completely eaten off within a fortnight. Crops which have grown very rank from any cause are much better fed-off, if at all practicable. Rank crops are liable to rust, to lodge, and to be injured by frosts, besides making large demands upon soil moisture. Reducing, by feeding-off, may ward off rust by allowing greater access of sun and wind. The base of the stem is strengthened by access of light, and lodging prevented. Frosts, under certain conditions, may rupture the cells of the nodes or knots of the bottom part of the stems. The stems of the growth after feeding-off are not so liable to injury. Moisture is conserved by reducing the transpiring surfaces of the leaves which are in excess.

Rolling and Harrowing.—Rolling is advantageous to consolidate light open soils and fit rough land for the use of machinery; it should always be followed by the harrows. Harrowing loosens the surface, preventing the subsoil moisture rising to be dissipated by sun and winds. A compacted rolled

Feeding-off Wheat by sheep.

surface has the opposite effect. Wheat after having been grazed should be thoroughly harrowed with sharp heavy harrows. It is preferable to harrow during early spring, before excessive evaporation from the surface of the soil commences; it may be performed when the crop is a foot high. It is better to harrow after a reasonable fall of rain, when the soil is fit to get on to with the teams.

Harvesting.—The stage to harvest wheat for grain varies with the class of machinery used and variety. String-binders, strippers, and complete harvesters are used. In the cooler, more humid districts, the string-binder is the most satisfactory. The stripper and harvester are more adapted to the drier districts upon level areas. Upon a large farm both the binder and stripper or harvester have their places A binder is used to cut what is required for hay whilst it is green; the same man, team, and machine should be used to cut wheat for grain before it is ripe enough to strip; when it is dead ripe the stripper may be used to advantage. Such practice fits in economically as

regards labour and horses. Stripping with stripper or harvester is unquestionably the cheapest method of getting the grain ready for market; it has the disadvantages of risk from storms and fires, whilst dead ripe in the field, loss of quality of grain and straw, and the fouling of the land with weed-seeds, which are left in the field. Stripped wheat is apt to be bleached by

Winter-proud Wheats injured by frost long before ears appeared; subsequent development.

Uninjured ear.

exposure after ripening in the field; a reduced price is always paid for such. If the harvesting period is wet and damp, considerable losses may result. Cutting with binder with the necessary carting, stacking, and threshing is much more expensive. The advantages of the system are less risk from shedding of grain, storms, and fires, and the better quality of straw and grain. With the binder it may be harvested to advantage when the crop is

quite tough, with a slight green tinge through it. Varieties liable to shed their grain are more economically harvested in that way. Many immature weeds are cut and removed to the stack as well as ripe ones.

Straw is saved before it is perished in the field, and is more nutritious; there is not the trouble of dealing with large crops of straw as after the stripper. If the soil is deficient in vegetable matter, 8 to 12 inches of stubble, if practicable, should be left on the land to be ploughed under; such prevents the soil from running together at the surface, and

Winter-proud Wheats injured by frost long before ears appeared; subsequent development.

is, in many ways, beneficial. The straw, after stripping, should not be burnt excepting upon soils too rich for wheat. The reduction of the organic matter of very rich soils may lead to the growth of less flag and better grain.

Generally speaking, the burning of the straw is very bad practice, and impoverishes the soil very quickly. Soils depleted of their vegetable matter by burning and cropping are not so retentive of moisture, and do not retain that desirable tilth so necessary to fertility. Considerable quantities of dry straw ploughed into the soil in dry climates keeps the land far too open to allow of a crop growing satisfactorily upon it directly after ploughing under. It requires time and moisture to allow of its desirable incorporation with the soil; means should be devised to effect this. A good practice would be to disc the land and sow a few pounds per acre of rape seed amongst the straw. If the weather proved favourable, a considerable growth of rape and self-sown wheat would be available for sheep-feed. The stock may eat a proportion of straw with the green feed, the rest would be trampled down and cause the ploughs very little trouble in a few months' time. The paddocks should then be ploughed during winter or spring; such would clean the land of weeds, conserve moisture, and allow of seasonable operations for next crop. This would, of course, mean that one wheat crop only would be sown upon the same land in two years; such practice has much to recommend it. Whereever practicable, land should be ploughed as soon as possible after harvesting to destroy weeds, and fit it for succeeding crops. The careful consideration of the above suggestions, and a rational application of them to the many conditions of the New South Wales wheat areas should lead to a considerable increase in the yield per acre, and profits for the individual farmer.

Appendix.

Analysis of typical wheat soil at Bathurst Experiment Farm capable of yielding 40 bushels per acre under favourable conditions:—

Locality of soil.—Bathurst.
Nature of soil.—Loam.
Depth of soil.—6 inches.
Colour of soil.—Dark brown.
Reaction of soil.—Strongly acid.
Capacity for water.—Fair, 43 per cent.
Absolute weight per acre, 6 inches deep.—1,663,194 lb.
Capillary power.—Very good, 8·5 inches.

Mechanical Analysis.

Coarse gravel, more than $\frac{1}{10}$ inch in diameter, 3·66 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter, 21·94 per cent.
Fine soil, sand 24·70 per cent.
,, impalpable matter, chiefly clay, 49·70 per cent.

Analysis of Fine Soil.

Moisture.—2·80 per cent.
Volatile and combustible matter, principally organic.—4·95 per cent.

Percentages of Fertilising Substances.

General Value.

Nitrogen ·056 per cent., equal to ·068 per cent. Ammonia, fair, equivalent to 931 lb. in an acre of soil 6 in. deep.

Soluble in Hydrochloric Acid, Specific Gravity 1·1.

Lime (CaO) ·184 per cent., satisfactory, equivalent to 3,060 lb. in an acre of soil 6 in. deep.
Potash (K_2O) ·136 per cent., satisfactory, equivalent to 2,261 lb. in an acre of soil 6 in. deep.
Phosphoric acid (P_2O_5) ·094 per cent., fair, equivalent to 1,563 lb. in an acre of soil 6 in. deep.

F. B. GUTHRIE.

WHEAT-GROWING IN NEW ENGLAND DISTRICT.

R. H. GENNYS,
Glen Innes Experiment Farm.

WHEAT will grow well on the New England tableland, and no better hay from suitable varieties can be produced if cut at the flowering stage and properly saved; large yields of grain in favourable seasons can be produced, but there are few varieties suited to the changeable climate, and careful selection must be made before good average yields can be obtained. It is found after careful observation and experimenting for four years that the best sorts are strong flour wheats that mature quickly. The time of sowing is important: if too early they may come in head before frosts are over, the flowering stage being a dangerous time in this connection; they should be harvested before Christmas, or they may be caught in the field by the summer rains which take place after that period. Good milling wheats of early maturing varieties sown rather late—say in June--are likely to prove most profitable. Manitobas also have a good chance if sown fully two weeks earlier; very early sowing is not recommended.

The district contains a variety of soils ranging from light granite to heavy clays of light, brown, and black colour, and until lately the two latter were deemed quite unsuitable for wheat-growing, but by draining, liming, and sowing them with suitable varieties, such as Jonathan, the Blue Stems, and Power's Fife, good yields have been obtained at the State farm, and these varieties have given fine yields on other farms from seed grown here, one--Bolton's Blue Stem—in a good sized area producing 40 bushels to the acre, which was sold locally at a good advance on local prices. Generally, however, the lighter soils for wheat-growing are recommended.

Climate.—The altitude of the district ranges from 2,000 to 4,000 feet above sea level. The climate is cold, heavy frosts occur through winter, with snow at intervals, an occasional fall of the latter being favourable to wheat growth.

Ploughing.—The mould-board ploughs are generally favoured in New England, but the occasional use of the disc in throwing up the soil to the weather is beneficial; for covering weeds the mould-board plough is always recommended. Ploughing with good heavy implements may be done at almost any time, except when the ground is too wet and cloggy, and this state is not infrequent; generally rather dry seasons are more appreciated than wet ones. For wheat the summer and autumn ploughings are generally from 5 to 6 inches deep, afterwards before the seed is sown a shallow ploughing of about 3 inches is practised. As a substitute sometimes the double disc cultivator is used; in this machine the two rows of discs follow one another, and one row can be set at any angle desired; if the land is not fine enough for the seed drill to

work across the path of the cultivator, then harrowing must follow the latter implement. Shallow working is done last for wheat in order that grain may have a sweetened top soil in which to germinate and get a good start in life, and also that the roots may find a firm condition in the subsoil.

Draining is most important in New England, a great proportion of the subsoil being very retentive. By draining, and at a small cost, the work being done by ploughs and scoops, a very wet piece of land of several acres produced 34 bushels to the acre of Power's Fife wheat.

Liming.—This is of great benefit in sour lands and heavy clays, making the latter more friable and sweeter, and besides being a necessary plant-food in itself lime tends to make other important plant-foods available. *Unslacked lime* must be used, and should be applied after one ploughing and one harrowing, then put on the land in convenient heaps to air-slack, which is the best; although, if required to spread quickly, this may be done with water. After slacking spread evenly over the surface and lightly harrow in, to incorporate with the top soil and leave at least a month before ploughing in, as lime has a tendency to work downwards. For wheat lands with fairly heavy soils 10 cwt. to the acre is of much benefit, but for very heavy clays from 1 to 2 tons to the acre may be used. Some 30 acres of land were limed here at the rate of 10 cwt. to the acre for cereals. The cost of the lime, which was brought from the Blue Mountains to Glen Innes, delivered at the latter station, was 34s. a ton, or at the rate of 17s. an acre. Liming in most soils is sufficient every six years.

Manuring artificially other than liming has not been largely experimented with hitherto, but it has been shown that phosphates in many cases are likely to be exhausted after a few years of heavy cropping, especially on the lighter soils. Thomas' phosphate gives, so far, very little better results than without manures; the quickly acting properties of superphosphates are of more benefit as they promote a good start for young plants and cause early maturity—two important points here. The soil here being generally of a clayey nature is well supplied with potash, though some friable ones and especially those which have been heavily cropped with potatoes, and where it is intended that wheat should follow, would be all the better of, say, 28 lb. of sulphate of potash mixed with 56 lb. of superphosphates applied to the acre. Sulphate of potash seems to act better in combination with superphosphate than by itself. It should be mentioned that the superphosphates when used alone are put in the drill at the same time as the seed and distributed at the rate of 56 to 60 lb. to the acre. Nitrogen which is so necessary to soils for cereals may be provided by sowing legumes such as peas or clover. Red Clover is doing well here and a three-course rotation consisting of (1) wheat, (2) clover, (3) maize or potatoes might be followed. The clover could also be eaten off in early spring by sheep and ploughed in in late summer. Rape has not done so well in clay soils, otherwise when sown with superphosphates it is a good practice to eat it off with sheep and then plough it in as a preparation for wheat, but of course it does not add nitrogen to the soil, but humus, and the droppings from the depastured flock add to the fertility of the soil.

Sowing.—Drilling in seed is better when the soil can be got into a fine state of tilth, but in wet seasons broadcasting may have to be resorted to. The quantity of seed used when sown by drill at the beginning of June should be about 50 lb. per acre, and three weeks later at the rate of 60 lb. per acre; as sowing early is not recommended, thick sowing is practised and early maturing is hastened. If grain is broadcasted, about 90 lb. of grain should be sown, say, for the middle of June. Too much rolling in New England is not desirable as land consolidates quickly enough without; but when rolling is required to break down clods, harrowing should immediately follow the operation—frequent harrowing in dry weather during growth of crop up to 5 inches high is advised.

Harvesting.—The use of the reapers and binders in preference to strippers is strongly recommended here as there is a tendency to uneven ripening, and the straw is of great value in the winter both for bedding and fodder for stock. When cut early the straw is more valuable in every respect.

Wheat-growing should only be adopted here as part of a system of mixed farming, and can be well carried on in connection with lamb-raising and breeding sheep for mutton purposes.

Wet harvests are a deterrent both in wheat and oat growing, but it is hoped that destruction and deterioration of grain may be minimised by the results of experiments now in progress at the State farm here, whereby the covering of stooks for weeks, if necessary, with cheap rye-straw caps devoid of grain is aimed at.

In favourable years several weak flour wheats have produced heavy yields of large, soft, grain, weighing at a heavy rate per bushel, but their milling qualities were bad. Farmers are advised to try some of the Department's crossbreds which are good yielders, less liable to rust, and of high-class flour strength; such as Jonathan and Comeback. The former has undergone severe trials during four years on all qualities of soils in the district; the latter has not had the same trial as yet.

Sussex, a wheat of fair strength, has given very good yields for several years, proving very suitable for the district. Power's Fife (a Manitoba of splendid flour strength) and the Blue Stems have also done very well, but should be sown earlier than the others on account of slow maturing.

Zealand, Tardent's Blue, Power's Fife, and the Blue Stems (Minnesota, Haynes', and Bolton's) are recommended for hay wheats.

In comparison with the drier districts with lighter soils the tillage of the soil is expensive, and strong teams of horses must be used; but on the other hand the rains being more regular, larger average yields can be expected. However, the right varieties must be selected, the proper time and methods of cultivation adopted, before wheat-growing can reach its most profitable limits in New England.

Forestry.

Some Practical Notes on Forestry suitable for New South Wales.

[Continued from page 637.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XVIII—*continued.*

Trees other than Conifers and Palms:

Oaks.

Japanese, Chinese, and Himalayan Oaks.

Oaks from Japan and China should be especially encouraged, as they are very interesting. Speaking generally, oaks want a good depth of soil, which they cannot obtain in the Botanic Gardens, Sydney, but there are thousands of places in New South Wales (coast and tablelands) where they should do well.

1. *Quercus acuta*, Thunb. var. *bambusæfolia*, Mast. Japan.

Received as *Q. bambusæfolia*. A small neat bushy species which never attains the dignity of a tree with us.

L 30 d.

2. *Q. Championi*, Benth. Hong Kong.

A handsome round-headed bush 4 to 5 feet in height, branching to the ground. Very slow growing with us. It has entire leaves with rusty undersides.

M 23.

3. *Q. cornea*, Lour. China.

The acorns are used for food in its native country. In the Botanic Gardens it is of rather straggly growth—a tall shrub or small tree. It has handsome transversely reticulate leaves, veins hairy underneath. The bark is covered with lenticels.

M 14.

4. *Q. cuspidata*, Thunb. Japan.

With us a small tree, but it certainly does not have fair play, being in a place with shallow soil and dominated by large trees.

The foliage is ornamental: the leaves are not large; the margin of the apical half is serrate.

The acorns, boiled or roasted, are regularly sold in Japan for food. See Sieb. and Zucc., *Fl. Japonica*, t. 2.

U 8.

5. *Q. glabra*, Thunb. Japan.

A small tree (cut back for reasons of space) with very large entire leathery leaves. It is the largest leaved Oak we have, and is specially handsome.

The acorns are used for food in Japan. See Sieb. and Zucc., *Fl. Japonica*, t. 89.

U 6.

6. *Q. glauca*, Thunb. Japan to the Himalaya. The Kashi of Japan; the Green Oak of lower altitudes of the Himalaya.

A tree with handsome laurel-like foliage, which grows into a handsome tree of medium size, with dense head; but some of our specimens have had to be pollarded because they would occupy too much room.

The timber is used in Japan for tool-making. Used for bridges and for rough carpentry in Northern India. See t. 23, vol. ii, *Ann. Bot. Gard.*, Calcutta. Brandis, *Forest Fl.* 488, t. 65.

M 9, 15; L 15 b.

7. *Q. incana*, Roxb. (*Q. lanata*, Sm.). "Grey or Ban Oak." See t. 20, vol. ii, *Ann. Bot. Gard.*, Calcutta.

Grows into a large umbrageous tree in the Botanic Gardens, Sydney, with handsome serrate-leaved foliage with white undersides. It is thoroughly at home in the Sydney district.

It yields a useful tan bark. The acorns are used in medicine in India, and are eaten extensively by monkeys and bears. The branches are often lopped for fodder.

U 8 c, 2 K; M 8; L 23 g, 30 d, 33 e.

8. *Q. lamellosa*, Sm. (syn. *Q. imbricata*, Ham.), Himalaya. The "Laurel Oak."

See t. 30, vol. ii, *Ann. Bot. Gard.*, Calcutta; Wallich, *Pl. As. Rar.* ii, 41, t. 149.

At Campbelltown it grows fairly well, and is thus reported upon by Mr. J. McEwen, Superintendent of the State Nursery:—

> This tree was planted about twenty-five years ago; height about 20 feet; habit rather loose and spreading; trunk about 12 inches near the ground. Has not made half the growth of some of the large American species near by. A very distinct species. Has borne acorns more or less during the last ten years.

It is much recommended for planting in the United States, and promises to be useful in the cooler parts of New South Wales.

9. *Q. serrata*, Thunb. Japanese "Silkworm Oak."

See t. 16, vol. ii, *Ann. Bot. Gard.*, Calcutta.

Our specimen is a very old tree, with bark almost like an ironbark. It is deciduous, with coarsely serrate foliage, reminding one somewhat of the Sweet Chestnut.

Although our specimen is not the best, it is obvious that it is a valuable tree, very umbrageous, and well worthy of acclimatisation experiments.

Bark used locally for tanning. The leaves are used for feeding the oak silkworm (*Bombyx Yamamai*). The timber is used for building purposes in Assam.

L 7.

A Correction.

The titles of the two illustrations in the August *Gazette*, pages 636 and 637—*Quercus Suber*, *L.*—have been transposed. That on page 636 should read as from Botanic Gardens, Sydney, and that on page 637, Camden Park.

Sheep at Bathurst Experiment Farm.

R. W. PEACOCK.

At the New South Wales Sheepbreeders' Association's Show, held in July, 1908, another practical demonstration of the results of the system of cross-breeding of sheep for export lamb and mutton was given. Twenty-four pens were exhibited, comprising in all sixty-one sheep. They represented first crosses, second crosses, and comebacks. A sheep from each of seventeen pens was slaughtered, and the carcasses exhibited in front of the pens, so that the quality of mutton could be readily seen. These, in conjunction with the live stock in the pens, afforded satisfactory opportunities for the study of the various crosses. What could be expected from a mutton point of view was apparent, and those interested could, by inspecting the live sheep, form an excellent idea of the value of the crosses from a wool-producing point of view, a most valuable aid in the selection of breeding ewes.

The sheep were depastured under rather adverse conditions. The drought affected the younger sheep especially; these could only be classed as good, and not prime. The older sheep were prime. The weights of both carcasses and skins are slightly in excess of actual weights, as they were weighed directly after slaughtering, and not allowed to cool: they are comparative.

The live weights given for the unslaughtered sheep are the average weights of the sheep weighed at the farm prior to leaving for Sydney, and are comparable.

Allowance should be made, when considering the table below, for the individuality of sheep. Although they were chosen very carefully as typical specimens, slight errors cannot be eliminated when figures are given for individuals only. For instance, the weight (20 lb.) of skin from hogget by Shropshire ram on Lincoln-Merino ewe is in excess of what could reasonably be expected, it being rather exceptional as regards its covering. Also the weight of skin, viz., 21½ lb., from comeback hogget with a proportion of Southdown blood, was heavier than should generally be expected from such, this individual unquestionably leaning towards the Merino as regards its covering.

The unslaughtered sheep will be shorn when the fleeces have made twelve months' growth. Their weights, and a report upon their commercial values, will be published when available.

The results of the slaughtering are in harmony with those of last year. (See *Gazette*, September, 1907, p. 741.) It is again interesting to note the effect of the greater infusion of the blood of the British breeds upon the weights of the carcasses, the second crosses being heavier than the first.

The decrease in the weights by the larger proportion of Merino blood in the comebacks is again noticeable. As regards attractiveness of carcass, those claiming Southdown, Shropshire, and English Leicester blood were ahead in the order given. The carcass of the weaner by the Southdown ram, from the Southdown-Merino ewe, was the most attractive. The plates give an excellent idea of the carcasses, the principal feature being a study in hind-quarters. The data obtained during the past Show will be valuable in conjunction with past and future results of a similar nature.

The following are particulars of weights, &c. :—

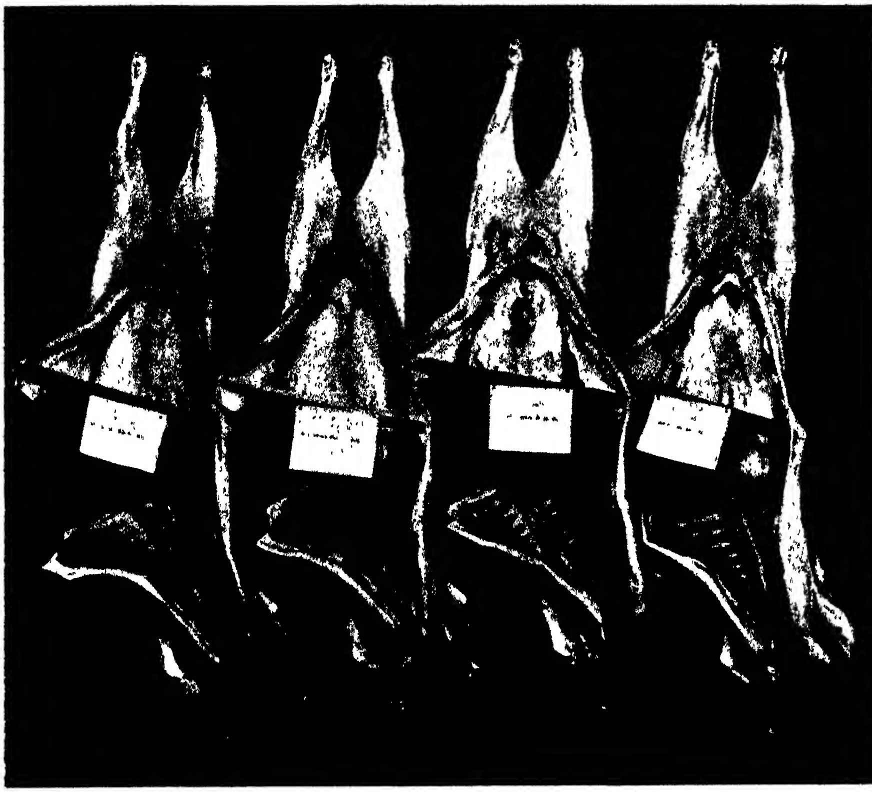
Breed.	Age.	Live Weight.	Dressed Weight	Skin.	Fat.
Hoggets.	y. m.	lb.	lb.	lb.	lb.
Lincoln-Merino	1 11	143	73	16½	12½
Shropshire-Merino	1 11	140	76½	15	13
English Leicester-Merino	1 11	126	67½	14	11½
Southdown-Merino	1 11	126	71½	11½	13
Lincoln ram on Shropshire-Merino ewe ...	1 11	157	80	13	14½
Shropshire ram on Lincoln-Merino ewe ...	1 11	140	75	20	10
Shropshire ram on Border Leicester-Merino ewe	1 11	161	85½	16	11½
Merino ram on Lincoln-Merino ewe	1 11	126	55½	19	8½
Merino ram on Shropshire-Merino ewe ..	1 11	120	59	15½	11
Merino ram on Southdown-Merino ewe .	1 11	120	58½	21½	8½
Merino ram on English Leicester-Merino ewe	1 11	105	48	16	8½

(The hogget skins had eight months' wool.)

Breed.	Age.	Live Weight.	Dressed Weight	Skin.	Fat.
Weaners.					
Lincoln-Merino	11	91	42½	17	7
Shropshire-Merino	11	78½	38½	14	7
Southdown-Merino	11	83	39½	13	6½
English Leicester-Merino	11	89	42½	13½	6
Shropshire ram on Shropshire-Merino ewe ...	11	97½	47	14½	6½
Southdown ram on Southdown-Merino ewe ..	11	93	51	11	7

(The weaners had eleven months' wool.)

Lincoln ram on Shropshire-Merino ewe ...	11	95⅔	Second cross.
Shropshire ram on Lincoln-Merino ewe ...	11	93	
Southdown ram on Lincoln-Merino ewe ...	11	90⅔	
Shropshire ram on Comeback ewe (Lincoln) ...	11	91⅔	Third cross.
Lincoln ram on Comeback ewe (Eng. Leicester)	11	89⅓	
Merino ram on Border Leicester-Merino ewe ...	11	97	Comebacks.
Merino ram on English Leicester-Merino ewe	11	92	



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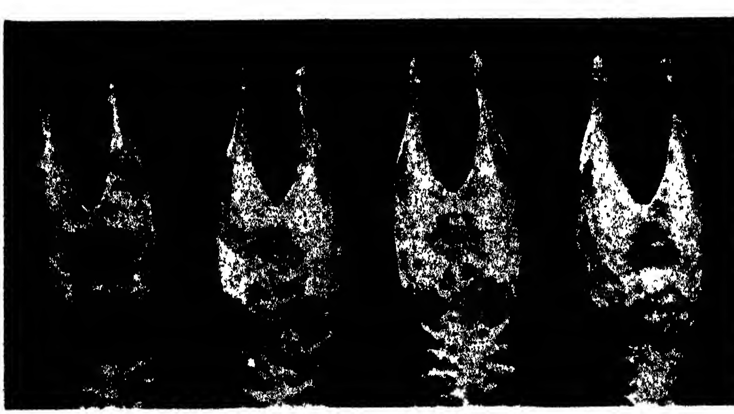
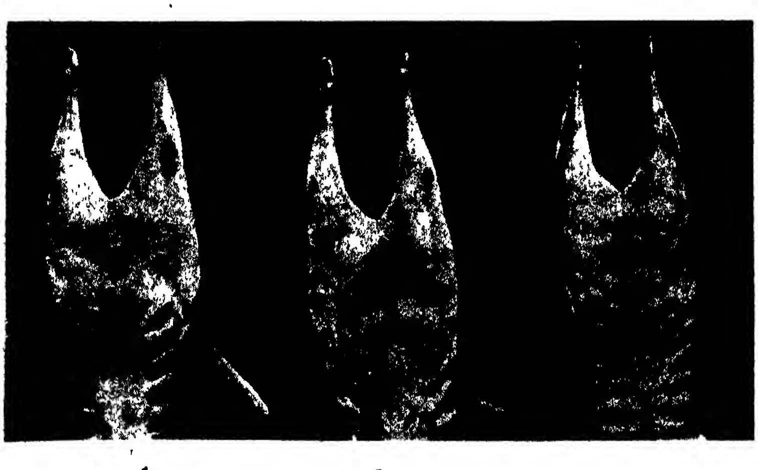


1 2 3 4

First Cross Hoggets—age, 1 year 11 months.

1. Shropshire ram on Merino ewe.
2. Southdown ram on Merino ewe.
3. English Leicester on Merino ewe.
4. Lincoln ram on Merino ewe.

1 2 3

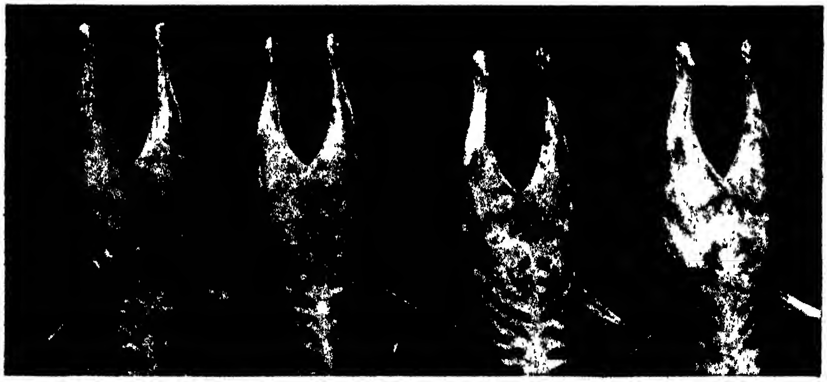


1 2 3

Second Cross Hoggets age, 1 year 11 months.

1. Shropshire ram on Lincoln x Merino ewe 2. Shropshire ram on Border Leicester x Merino ewe.
3. Merino ram on Shropshire x Merino ewe (comeback).

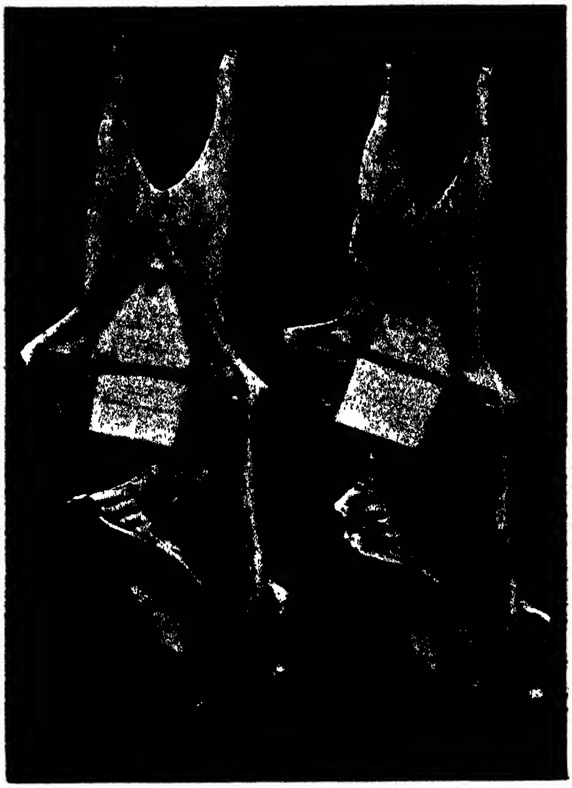
1 2 3 4



1 2 3 4

First Cross Weaners—age, 11 months.

1. Shropshire ram on Merino ewe.
2. Southdown ram on Merino ewe.
3. English Leicester ram on Merino ewe.
4. Lincoln ram on Merino ewe.



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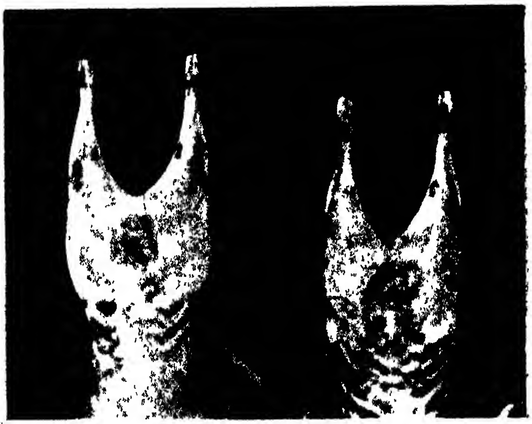


1 2

Three-quarter bred Weaners—age, 11 months.

1. Southdown ram on Southdown-Merino ewe.
2. Shropshire ram on Shropshire-Merino ewe.

Diseases of Fowls.

[Continued from page 656.]

G. BRADSHAW.

CHAPTER XI—*continued.*

Various Diseases—*continued.*

Egg-eating.—This vicious habit is quite common amongst fowls, and once acquired is difficult to cure, and at times the trouble is serious, for one or two hens may be laying, and the owner unaware of it, owing to the disappearance of the eggs as soon as laid.

Many causes are assigned for this habit, such as the want of shell-making material, &c. The principal cause, however, is from the accidental breaking of an egg. The hen tries this, finds it good, and then begins to peck at the whole article, which she breaks, and eats the contents, and repeats at every opportunity.

The suggested remedies are many and varied. Catching the culprit and with a file removing the sharp end of her beak, is a method adopted by some poultry keepers, with success.

Keeping a plentiful supply of china eggs in the nests and throughout the runs has also been effective.

A common method is filling an egg shell with mustard, made into a paste, and placing them in the runs. Aloes have also been used instead of mustard, while some breeders have been successful in curing the habit by leaving rotten eggs about; but in many instances all the above remedies have been ineffective, the hens leaving the artificial eggs, and continuing to eat the genuine ones.

This habit, if acquired by a few hens in a run, may be responsible for the disappearance of every egg laid, and the losses due to it have been serious.

The following is extracted from an article by a Sussex poultry breeder:—

Sometimes the cock is the culprit, but the question of sex matters little. When egg eating breaks out it must be checked—for no eggs, no profit.

There is no disease—for it is a disease—in the poultry world with so many infallible cures for it as egg-eating. But, prevention is better than cure: First, keep fowls well supplied with shell-forming material, so that shell-less eggs are not laid; also see that the nests have plenty of straw or litter of some kind, then there is less liability of the eggs being broken. It is very uncommon for a hen to drop her egg when on her perch, but eggs are often dropped in the run, and care should be taken to remove them immediately. Eggs should never be lying about within sight of the hens, especially when they are in confinement; often, for want of something better to do, they peck at them. Fowls at liberty seldom turn egg-eaters.

The best cure, and I have tried a good many, is cutting the bird's beak. The mandibles, both upper and lower, are quite soft, save for the edging of horn; this is hard enough: we often carry the marks of a hen-peck for days on our fingers, don't we? Procure a fairly sharp penknife, and take the egg-eater between the knees. Now proceed to cut the point of the beak; do it very delicately, whittling away the hard, clear edge. Presently

Illustration showing ovaries and stages in growth of egg.

+ Twin ovules : These joined drop into the oviduct, and become covered with the white and shell, forming a double-yolk egg.

the blood will be seen showing through, then stop. Do the same with the lower mandible. On no account draw blood. Properly performed, the operation is quite painless to the fowl.

What is the effect? The fowl cannot peck at anything hard any more than a man can bite with a sore tooth. She can eat soft food and pick up grains of corn, eat as well as usual, but if she attacks an egg the hard shell daunts her—it makes her beak smart, and she speedily desists. Presently the horn grows again, but by that time the hen, unless the vice is fairly established in her, has forgotten her taste for eggs. If egg-eating breaks out in a small pen, and there is no absolute certainty which is the culprit, cut the beaks of the whole pen

As to the other remedies, the most common is to fill an egg-shell with mustard and pepper and put it in the run. A hard-boiled egg just out of the boiling water is also said to be a cure, as it burns them. Fresh egg-shells given in large quantities is an American remedy highly spoken of. In fact, there are any amount of remedies.

I have said nothing of specially constructed nests. These are so made that when the egg is dropped by the fowl it rolls out of sight. The difficulty is to make a nest so constructed comfortable enough for a hen to lay in it. On the whole, the egg-eating-preventing nest is no good.

The only absolute safe way of curing an egg-eater is to wring her neck. Do not let the vice go on; always be or the look out, and if it breaks out, cure it at once. A whole flock of hens may be ruined as egg-producers if this is not done. There is, as I have said, a choice of remedies, and the poultry-keeper has only himself to blame if he loses many eggs by egg-eating hens.

Egg Organs.—The egg-producing organs of a hen are very delicate, and subject to a number of complaints, which have probably increased since the inception of the egg-laying competitions, as evidenced in the conductors' reports, which usually tell us how many hens died during the month, and in almost every instance "from ovarian troubles." Realising this, it is well breeders should be acquainted with the nature and function of the egg organs.

Organs and ovary of hen.

1. Liver.
2. Gall bladder.
3. Spleen.
4. Gizzard.
5, 5. Duodenum.
6. Pancreas.
7. Intestine
8, 8. Free extremities of cæca.
9, 9. Opening of ureters.
10. Heart.
11. Stomach.
12. Lung.
13. Ovary.
14. Egg.
15. Egg entering oviduct
16. Infundibulum.
17. Oviduct.
18. Egg passing through oviduct.
19. Oviduct.
20. Cloaca.
21. Opening of the oviduct.
22. Margin of anus.

Anyone who has dissected a hen is, no doubt, familiar with the cluster of small eggs that are found in her intestines; they resemble very much a bunch of grapes, and vary in size and number. In a good-laying strain of hens they will often number a hundred or more. The section where this rudimentary egg is formed is called the ovarium. It will be noticed that all these eggs are covered separately with a filmy and transparent sac, and connected by a very narrow stem to the ovary of the hen. These rudimentary eggs are in the very first step of egg-formation, and their number controls the laying capacity of the hen in the finished product at the end of her laying period. They are the supply upon which she draws. They mature one at a time, growing larger and larger, and gradually separating from the cluster, and when matured in the ovarium, they detach themselves, their weight causing them to fall into a funnel-shaped tube, which leads direct to the oviduct. In the passage from the ovarium to the oviduct, the egg travels an average of 24 inches, and in a well-fed healthy hen, they follow one another very rapidly.

During this state, the egg consists of nothing but the yolk; the white is added later. This is added to the yolk in successive layers, and is drawn or secreted from the blood-vessels in the oviduct. It is a thin, sticky fluid, and, were it not for the sac which covers the yolk, the two would quickly form into one mass. A second sac is added during its passage to the oviduct, which greatly strengthens it. These sacs will be found to be very adhesive; they can be pricked with a needle, and the very moment the needle is withdrawn they will close up tightly, and prevent the yolk oozing out; but if the egg is allowed to lie in any one position for a time, it will adhere closely to the shell, and cannot be separated from it without breaking.

The germ, which is the existence of the future chick, lies very close to the yolk. This is why it is advisable to turn eggs intended for hatching very frequently, thus preventing adhesion, which, of course, is fatal to the germ. The germ is held in its place on the yolk by what appears to be two twisted cords, which are embedded in the white. They are of an albuminous character, and very strong, serving to keep the germ in its place when the egg is in motion, and also to keep the germ uppermost during the entire period of incubation, so that it will receive, all other conditions being correct, the required amount of heat—no more and no less.

When the egg is about half-way through the oviduct, it becomes covered with the two sacs found just inside the shell. They lie close around the egg until they approach the large end, where they separate and form what is so familiarly known as the air-cell. In a newly-laid egg the air-cell is very tiny, and as the egg advances in age the air-cell becomes larger. This is due to the contracting of the entire mass within the shell—caused by evaporation.

After the egg has advanced well down into the oviduct, it becomes covered with the shell; but the shell, like the albumen or white, is added by a system of secretion from the blood-vessels of the hen. Very frequently the hen lays what is called a "soft-shelled" egg. Some advance the theory that this is due to lack of grit, oyster-shell, or other "shell-forming" substances. This is untrue. The real reason is this: Over-stimulation results in the excess of ova matter, and, as the eggs are continually advancing, two of them drop into the oviduct on the same day. Only one becomes coated with shell, and, naturally, in its advancement, the second egg is laid without the shell. Condition powders and stimulating foods are the real cause of this trouble, and we have also noticed that it can be caused by improper feeding, overfeeding one day and protracted starvation the next, and so on.

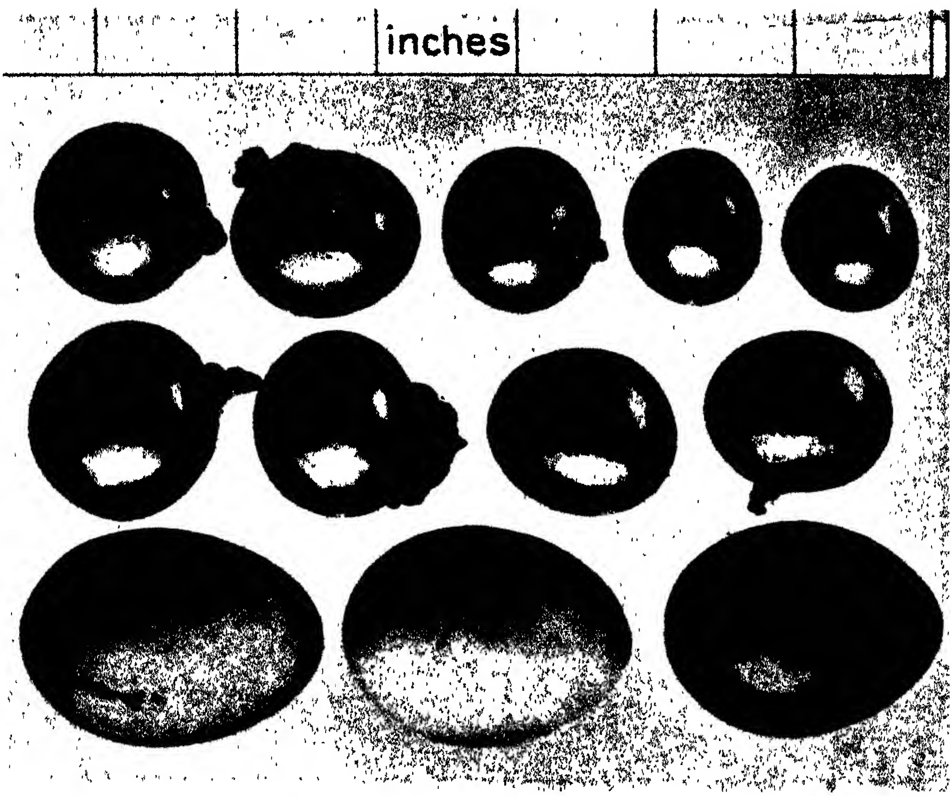
Another result of stimulating feeding is the double egg, often called "double-yolk." This, in fact, is really a double egg, white and all. The cause of this is that when the eggs are maturing too fast, two of them fall into the oviduct together, and are encased in one shell, each one of them having a complete white and yolk of its own. If incubated and hatched (which they seldom do), they produce one of the monstrosities seen in consequence, such as a chick with more than two legs, &c. Of course, these never live.

It requires about twenty-four hours for the shell to form, but very often a second ovum rests against the first just before the latter is laid, and, when complete, it presents a flat, crooked, or dented shell—this according to the position in which it lays against its perfectly-shelled mate. Of the many freak eggs met with, probably the tiny, marble-sized egg is the most frequent. After the hen has exhausted her supply of ova, her secreting organs are still actively engaged producing albumen and shell. This results in the tiny egg, which is only a shell, covering a quantity of the albumen. This egg has never been attached to the ovary, which accounts for its size and the absence of the yolk; and is, of course, unhatchable under any condition.

Very often we hear of the complaint of a strictly fresh egg being "rotten." This is caused by the oviduct being too fat; the egg cannot force its way through the fat, and if retained for two or three days in this position, the body heat of the hen will cause it to become addled.

Egg Passage.—Protrusion of the oviduct, or egg passage, is occasionally met with in the poultry yard, and usually with old, over-fat hens. It is caused by the straining to expel large eggs, and is evident at a glance. The organ should be washed with warm water, oiled, and with the finger gently returned, keeping the hen's head downwards, so as to favour the simple operation. After this, a dose of castor oil is recommended. Further treatment is very rarely required.

Egg Passage, Inflammation of.—Inflammation of the egg passage sometimes occurs in connection with an egg-bound hen, or it may result from over-stimulating food. The disease is a serious one, its effects being witnessed in the action of the fowl, which has a constant desire to strain as if an egg was to be laid. The fowl stands about with wings dropped and feathers ruffled, while the underparts are hot, and the comb and wattles less red than normal. Cases of this sort are rarely curable, although there are instances when half a teaspoonful of sulphate of magnesia in warm water has done good. When this remedy is tried, a little salad or sweet oil should be dropped into the vent, the head being held down when this is being done.



Stages in the development of fowl's egg.

Eggs : musty flavour.—Quite often actually new-laid eggs have a stale musty flavour. This may result from liver or other disease, or from strong flavoured food. Musty meals, fish, mangolds, putrid meat, or stale cut bone, all contribute to ill-flavoured eggs, the remedy being to remove the cause.

Eggs, soft.—Shell-less eggs are often attributed to want of shell-forming material, and while this may be the case, in some instances the cause of the trouble is more frequently in other directions.

If fowls have a free run, either on a farm or suburban area, they usually find sufficient shell-making material, but when kept in small pens, they must be supplied with old mortar, oyster shell, or any of the several materials now vended by produce merchants. Continuous feeding with soft food induces soft eggs, and sometimes extraordinary good layers produce such, from the fact that the resources of the system cannot supply the shell quick enough. Fright has been known to induce soft eggs; over-stimulating food and fatness are also responsible. The treatment is to remove the causes, to feed the hens sparingly, and to supply a variety of egg-forming materials. One authority recommends giving the hens lime-water to drink, accompanied with an aperient and a little sulphur.

Double egg. Both parts contain yolk and white, although one is not full; two-thirds natural size.

Lewis Wright attributes the majority of such cases to overfeeding, and suggests doses of Epsom salts. It, however, should be mentioned that soft eggs are most frequently laid by hens three or more years of age, and when fowls are kept with the object of profit, they will not yield enough to pay for their food. Consequently, by removing the non-paying ones, the soft egg producers will also be largely weeded out.

Favus, or White Comb.—This is a comparatively new disease in England, and was unknown in Australia until the visit of the late W. Cook, about 1900, when it was introduced to several poultry yards here by purchasers of some of the importations of that breeder.

Mr. W. Vale, an English authority, says the disease first came under his notice amongst some Orpington fowls, the symptoms of which are, at first a circumscribed spot on the small protuberances of the comb. The skin on the surface of the affected part is soon destroyed, and becomes detached in minute scales, so that the comb has a whitish appearance, hence the name of White Comb. The affection soon spreads to the face and neck, and its mode of advance, together with its contagious nature, makes it very evident that it is a distinct disease. When the fowls are badly infected, a peculiar

"mousey" odour is given off, and the feathers can easily be pulled out. The affected parts become very irritable, which causes the fowls to scratch, and the part soon becomes stripped of feathers.

The cause is attributed to a parasite, and rapidly spreads.

Another authority describes it as a scurvy eruption, not unlike to the human disease known as eczema. The comb looks as if flour had been dusted on it, and in severe cases a running sore will start, when the remedies have to be drastic. The best thing to do is to saturate the comb with paraffin or turpentine, and then rub it over with carbolic ointment, and to repeat the process morning and night for two or three days, when a cure will probably be effected.

The disease has of late become so prevalent in England that a few months ago the Secretary to the Board of Agriculture issued the following leaflet on the subject:—

Favus is a disease produced by a minute parasitic fungus known scientifically as *Achorion schœnleinii* (Remak). This fungus attacks the comb, wattles, and neck, &c., of birds, and causes the feathers of the latter to fall off; sometimes one side only of the neck may be affected, becoming quite deplumed, while the other shows no signs of invasion; but, as a rule, it is the comb that suffers first and most from the attack.

It is very destructive in poultry yards, and, being highly contagious, often spreads with great rapidity. A single diseased cock soon contaminates the whole run, and several outbreaks have been traced to a new male bird from an affected yard.

The first signs of an attack of favus are small, pale, irregular, cup-like spots on the comb or wattles, generally appearing on the comb first. These spots grow together, and sooner or later form a confluent covering of a dirty yellowish-grey substance, which is often arranged in concentric layers. These crusts often grow to a considerable thickness. When they are present on the comb or wattles there may be a complete and rapid disappearance of the malady; but when the feathered areas become invaded it is more persistent. Sometimes the breast, and especially the rump, is denuded by this fungus, which, when present on the feathered parts, usually ends fatally, unless treatment is resorted to. The feathers become erect and dry and fall off, and leave the denuded skin covered with dull yellowish-grey crusts, showing here and there depressions from which the feathers have fallen. The fungus may easily be observed by scraping the diseased surface or the skin under the crusts, and examining the debris under the microscope. It will then be seen to consist of a number of fire threads (the mycelia) and numerous spores, sometimes nearly the whole mass being composed of the latter. To examine the fungus, the débris from the skin and crusts should be put on a slide, and then moistened with distilled water and a little acetic acid.

Care should be taken in handling patients, as the disease can be transmitted to man, on whom it is not so amenable to treatment as in birds. It is probable, however, that the disease can only be planted, either naturally or artificially, on an abraded surface.

Treatment.—The treatment consists in bathing the invaded parts with warm water and soft soap, and then applying some ointment to destroy the parasite. Nitrate of silver well rubbed into the comb and wattles has been found of great benefit; an ointment of 5 per cent. of the nitrate of silver in lard may be used for this purpose. Red oxide of mercury one part, to lard eight parts, has proved an excellent remedy if used for several days.

In any case, it is most essential to well foment the diseased parts previously to applying the ointment, and to remove as far as possible all the favic crusts with a blunt knife. One cannot be too careful in examining a fresh bird before turning it into the run, which, needless to say, should not be done if any signs of "favus" are noticed upon it.

Should the disease appear, the bird should be at once isolated and treated, as when the parasite reaches the feathered tracts it is so much more difficult to eradicate.

Feather Eating.—This is one of the most annoying afflictions of the poultry yard, particularly to those who are obliged to keep their fowls in confined spaces; indeed, it rarely occurs in flocks that have a free range.

The evidences of feather eating are, that one or more of the flock will be seen to have bare patches, the denuded parts being usually the neck, breast, and thighs, but the baneful habit is such, that instances are common where the birds have been plucked almost to the last feather; the peculiar part being that the subject usually lends itself to the cannibalistic habits of the culprit, and seems to enjoy the operation.

The causes are varied, sometimes due to overcrowding, when the fowls have to stand about all day with nothing to engage their attention; one of them may see an insect on its neighbour, and pecking it off accidently brings a feather with it. If this be a young growing feather the blood in the quill end attracts the fowl, which eats it, finds it palatable, and the habit commences.

Sometimes it is due to an insufficient supply of greenstuff, but more often to a shortage of animal food. Instances are in evidence where the habit was due to the male bird having torn some feathers off the hen, and which were at once seized on by the other birds, and the habit acquired.

Unsuitable dieting is also responsible, particularly where there has been an insufficiency of animal matter in the food. In all flocks of fowls there are always one or two who tyrannise over the others, which is more pronounced at feeding time. In pecking at them the feathers are drawn and eaten, the objectionable habit being, in this way, acquired. There are also cases where it is difficult to exactly tell what induced the feather plucking, but the great proportion of imported fowls which arrive with bare patches show that confinement, and nothing to do in the way of scratching is responsible for the greater number of cases.

The remedies are simple. Observation will soon determine whether one or more of the flock have the habit; if it is confined to one or two the best plan is to get rid of them. If a number are addicted to the vice, then the runs should be thickly strewed with chaff, hay, straw, or litter of some sort. The morning food should be given of wheat or other grain, well scattered amongst the litter. This should be given by daylight, or as soon as the fowls leave their perches. Immediately on coming into the run they will commence to scratch for their morning meal, and if the quantity given is too small for their needs, they will continue scratching until every grain is found. After this there should be a cabbage, lettuce, or other green food hung up in their run at a height so as to oblige them to jump up a little for it.

There should be a fair supply of meat, such as boiled liver, or any sort of meat scraps thrown into the run at midday. This will keep them occupied until the evening meal, which should be again grain, or if soft food is given at evening, such should be withheld until just before roosting time, when the fowls will eat their meal heartily and go to roost forgetful of the feather diet.

A more effective way still of combating this vice is to wait until the fowls have all gone to perch, and then scatter their breakfast grain for the following morning amongst the litter, so that the fowls, when they alight off their

perches, immediately commence scratching, which can be kept up throughout the day. An adoption of this method of feeding has been successful in many instances.

Flowers of sulphur has been much used for feather-eating fowls, the usual quantity being a tablespoonful for twenty fowls, the way of administering being to mix it in the soft food.

Preventive measures for this and a number of other poultry-yard troubles will always be found best. A spare diet, but containing a sufficiency of nourishment, including animal matter, and if possible, a free range. In places where litter is not obtainable the grain can be raked into the earth, thus giving the fowls occupation and exercise, lack of which is frequently responsible for the feather-eating habit.

Gapes.—This is a chicken disease, and more pronounced in England than elsewhere. It is most prevalent in spring, and attacks chickens, turkeys, and pheasants from a few days to two or three months old, and is said to be responsible for over 50 per cent. of the chicken deaths in that country.

In some of the moister American States it is severe, in others mild, while in Australia it is scarcely known. Some breeders here who lose chickens, occasionally attribute the deaths to gapes. At the same time I have never seen an actual case of the malady here, as known in the United Kingdom. Old Country breeders resident here have been consulted on this subject, and all affirm that Australia is free from the disease. The chickens affected are observed to open their mouths and gape, which is accompanied with a sort of choking cough. This becomes worse, when, if nothing is done to relieve them, they choke and die.

The cause is a minute round red worm, which has a smooth body and pointed tail, and about one-third of an inch in length. They are located in the windpipe, and become so numerous as to block it up and cause suffocation. Many English poultrymen have so-called certain cures, and possibly some of them are certain. One is to catch the chicken and put a pinch of salt down its throat, and repeat the dose the following day. Another is to moisten a camel's hair brush in terebene, and pass it down the bird's throat. Oil of Scotch fir, turpentine, &c., to be applied in the same manner as above. The passing of a feather down the windpipe and twisting it round will remove the worms. The inhalation of sulphur fumes, and the fumes of carbolic are also said to be reliable remedies.

Indigestion.—Indigestion is something that interferes with the digestive or assimilating organs. It may arise from overfeeding, sometimes from a weak digestive system, want of grit, or too much soft food. Often a fowl will be observed to extend its neck during the day, which is its effort to remove the load of a large feed, or the too slow digestion of an ordinary meal. Sometimes it is accompanied with impaction of the crop, which should be removed in the manner suggested for such ailment. After that, the remedial measures are correct feeding, and the addition of a teaspoonful of sulphate of magnesia to every quart of drinking water.

Inflammation.—Inflammation of the lungs, liver, and other internal organs rarely respond to treatment.

Joints, enlarged.—Enlarged joints are most commonly met with in consumptive poultry. The knee joints are usually those affected, and frequently very little can be done in the way of a cure. In most cases it is the cockerels that become affected, and if the birds are otherwise vigorous, the following ointment can be applied with effect:—

Iodide of potash	30 grains.
Iodine	15 „
Lard	½ ounce.

Mix, and rub the enlarged joint each day.

Kidney Disease.—Very little is known of kidney affections in fowls, although *post mortems* have shown that these organs are frequently the seat of disease, such as congestion, tuberculosis, &c.

Lameness.—See Leg Weakness.

Liver, Congestion of.—This disease is chiefly denoted by bilious evacuations. The treatment is a lessening of stimulating foods, and pills made of—

Powdered sal-ammoniac	3 drachms.
Extract of taraxcum	1½ „
Extract of belladonna	12 grains.

Mix and divide into four pills; give one every two days. A little powdered gentian should be mixed in the soft food.

Moulting, although sometimes spoken of as a disease, is really not so, but a natural annual casting, or throwing off of the old weather-worn covering, and the provision of a newer and warmer suit for the coming winter. It commences early in the autumn and extends for several weeks, and sometimes months. With young birds the process is of much shorter duration than with old ones, and laying is rarely commenced until the new covering is completed. During moulting time the sexes should be separated, and not mated until they are required for breeding purposes.

Paralysis.—This is but a symptom of a disease, or disordered state of some part of the fowl's system.

Peritonitis is an inflammation of the lining of the bowels, and discovered only in *post mortem.*

Pneumonia.—Inflammation of the lungs, which see.

Poisoning.—Fowls are liable to suffer from various poisonous agents, either picked up inadvertently, or the poison may be laid down maliciously.

Barium is an ingredient of rat poison, the fowls sometimes getting it this way through inadvertence. The symptoms of barium poisoning is a paralysis of the fowl, and if detected in time, 20 or 30 grains of Epsom salts and sulphate of soda is a good antidote. Arsenic and antimony produce dysentery and great thirst; very little good will result from treatment. Lead poisoning mostly occurs accidentally, through the eating of paint from old tins, &c. Strychnine is a deadly poison, and if it gets amongst fowls the deaths are wholesale. The symptoms are twisting of the muscles, and

spasms of the most violent kind, with speedy death. Phosphorus is not a very common cause of poisoning, the symptoms being similar to those of arsenic, but easier detected by the poultryman, as the poison can be smelled, and if the interior of the fowl be exposed in the dark it will be luminous.

Rheumatism.—See earlier reference.

Scaly Legs.—See pamphlet issued by the Agricultural Department, No. 945. Treat the affected legs with a mixture of equal parts kerosene and sweet oil.

Tuberculosis, Consumption, Scrofula.—See earlier references.

Vertigo.—Fowls are occasionally affected with staggering, or suddenly running round in a circle; more especially does this occur during exposure to excessive heat. It is quite possible that it arises from several causes. The best thing to do is to put the bird's head under the cold water tap, and then give a dose of castor oil or jalap. About 12 grains of the latter are quite enough for an adult bird. Half this dose for chickens.

Wounds.—Poultry rarely meet with injuries, unless inflicted when fighting with another. The wounds are then simple ones—bathing with warm water, and a dressing with vaseline being usually sufficient. Other simple wounds can be brushed over with Friar's balsam. Boracic acid ointment may also be used for cuts or skin irritation.

CHAPTER XII.

A Poultryman's Medicine Outfit.

Almost every ill to which fowls are heir has been dealt with, those of a serious nature receiving most attention, the remedial measures suggested being largely the result of research amongst the leading English and American poultry authorities.

While some of the maladies are not of much importance, they may, if neglected, spell ruin to the poultryman, and realising this, it is the best policy to be always in readiness for any outbreak, and to that end the following list of simple drugs may well be stocked:—

Areca.—This is the simplest remedy for intestinal worms. The ground nut is usually given made up in the form of a bolus with a little fat; 10 or 12 grains is a dose for one fowl.

Calomel (subchloride of mercury).—This is a very useful alterative medicine for fowls, 1 grain pills frequently having a good effect on the liver. When given it should be followed in two hours by a dose of castor oil. Some authorities oppose the use of mercury in any form for poultry, but there have been numerous cases where it has produced good results.

Capsicum (Cayenne).—Is considered to be an excellent liver stimulant when given in small quantities. In cases of colds it is also useful, and forms one of the ingredients in the spices so much used to stimulate winter laying.

Catechu.—In powder or tincture form, in combination with powdered chalk, is a good remedy for diarrhœa. The average dose of powdered catechu is from 2 to 5 grains, and of the tincture from 2 to 5 drops.

Chalk Powder (prepared chalk).—Is generally given for diarrhœa, and is in most cases effective. When dysentery has set in, which is readily known by the blood in the evacuations, it should not be used.

Cinchona Powder.—Is the powdered bark from which quinine is extracted, and is often used in poultry tonic powders for birds "off colour."

Creosote.—Some breeders use a small quantity of this in the drinking water when roup is about; 2 drops to about each half pint of water is sufficient. It is also used to dress the throats of fowls suffering from diphtheria. Creosote is closely allied to carbolic acid, its antiseptic qualities being generally acknowledged. It is also used as a disinfectant and vermin destroyer.

Gentian Root.—A most useful remedy. As a powder it forms a principal ingredient in cattle and poultry spices. In the extract state it is a thick, treacle-like matter, and is used as a basis for making up pills. In combination with liquorice-root powder it is made the vehicle for the administration of other drugs.

Castor Oil.—Although apparently paradoxical, this is one of the best remedies for diarrhœa. The latter is frequently due to some fœtid matter in the intestines; a dose of oil will usually remove this, and often diminish the diarrhœa. It is also used in cases of crop-bound fowls. A teaspoonful poured down the throat, and the mass kneaded with the fingers, and then warm water poured down will soften the matter, and frequently effect a cure.

Epsom Salts (magnesium sulphate).—Is one of the simplest, cheapest, and most effective poultry-yard drugs. It is useful in liver disease, diarrhœa, and many other complaints. Half a teaspoonful for a full-grown fowl is a standard dose. It can be mixed in the soft food, but is more effective by starving the fowl for a few hours, dissolving the salts in warm water, and pouring it down the bird's throat. Epsom salts always act best accompanied with a good quantity of water.

Cod Liver Oil.—Is a fine remedy for a fowl wasting from liver disease, or those debilitated through colds, &c. Half a teaspoonful three times a day is a proper dose.

Linseed Oil.—Is sometimes given to exhibition fowls at moulting time. It assists the feathering, and gives a general glossiness to the plumage.

Olive and Salad Oils are useful when hens are egg-bound, for diarrhœa, and also for external use in dressing torn combs and other wounds. In eye troubles it takes the place of a simple lotion.

Opium.—In the tincture form of laudanum is most useful in diarrhœa, particularly after a dose of castor oil. Occasionally it is administered in conjunction with the oil, 2 drops being added to a teaspoonful of the oil.

Sulphur is a useful medicine, but should not be given to laying hens, as it is said to tend to flavour the eggs. It is beneficial during the moulting season.

The above constitute about all the medicines required in the poultry yard. There are, however, a few other things, such as vaseline, glycerine, &c., which should have a place in the poultryman's medicine chest.

For administration of the proper quantities it should be stated that the apothecary's pound contains 5,760 grains—12 ounces to the pound, 8 drachms to the ounce, 3 scruples to the drachm, and 20 grains to the scruple. Apothecaries' scales and set of weights can be had at trifling cost.

The Jute Fibre Nuisance.

A defect in the present packing arrangements is in the poor quality of the packs used, and so serious has the question of vegetable matter in wool become, that the Bradford Chamber of Commerce, and other important institutions upon the Continent and in Australia, have addressed circulars to wool-selling brokers and growers on the subject. Spinners and manufacturers complain that increasing quantities of vegetable matter, such as fragments of hemp, jute, string, etc., are found in the wool, which depreciate the value of their purchase, and frequently cause considerable trouble in some of the processes of manufacture, when jute fibres are not noticed by the sorters.

This subject is worthy of the most serious consideration of all concerned. Many recommendations have been received from various centres, the most practical being :—

(1) Do not tie the fleece with anything at all, and on no account with twine.

(2) Use packs made smooth side inside, loose topped, and cut down 16 inches at the corners. Have the bale stitched with coloured twine. As even the smooth side of the present-day jute pack gives off a certain amount of loose fibres, it is advisable to singe or brush off same before packing the wool.

(3) Many owners of high-class fleece and lambs' wool are ordering the ordinary jute pack made loose top, cut-down sides, with a cheap glazed calico lining, made slightly larger than the outside pack, so that same need not take the strain. By using this pack and sewing with coloured twine, the wool will not only be quite protected from jute fibre, but also from a certain amount of dirt which finds its way through the ordinary pack in transit to seaboard, on board ship, and on wharves. —*Dalgety's Wool Review.*

Hawkesbury Agricultural College and Experiment Farm.

Cost of Producing Crops in the Hawkesbury District.

Estimated by the Staff at the Hawkesbury Agricultural College.

Average wage, between 4s. and 5s. per day—say 4s. 6d. per day.

Average cost of feeding a horse on a farm, where all the feed is produced, and good paddocks are available, is about 5s. per week.

The average working life of a farm horse is about 12 years, viz., from 4 to 16 years. Value at 4 years, say, £30. Therefore, depreciation equals $\frac{30}{12}$, or £2 10s. per annum, or 1s. per week.

Cost per day is, therefore, $\frac{5s. + 1s. \text{ depreciation}}{6}$ equals 1s. per day.

Single-furrow Ploughing.

	s.	d.
Wages	4	6
2 horses, at 1s.	2	0
Wear and depreciation	1	0
	7	6 per acre.

1 acre per day.

Wear of share would depend on nature and condition of land.

Double-furrow Ploughing.

	s.	d.
Wages, 1 man at... ...	4	6
Horses, 4 at 1s.	4	0
Wear and depreciation ...	2	0
	10	6

or 5s. 3d. per acre.

Three-furrow Ploughing.

	s.	d.
Wages, 1 man at	4	6
Horses, 6 at 1s.	6	0
Wear and depreciation ...	2	6
	13	0

or 4s. 4d. per acre.

In light soil 3 and 4 horses, respectively, would be sufficient.

Harrowing or Rolling.

	s.	d.
Wages, 1 man at	4	6
Horses, 3 at 1s.	3	0
Wear of implement, say	0	6
	8	0

12 acres per day, or 8d. per acre.

Drilling Wheat.

	s.	d.	
Wages, 1 man	4	6	Cost of drill, £40; life, 6 years,
Horses, 3 at 1s.	3	0	or £6 13s. 4d. per annum of 30
Depreciation	4	6	working days, or 4s. 6d. per day.
	12	0	for 9 acres, or 1s. 4d. per acre.

This is not allowing for a lad to pull up tines, which would cost 3d. or 4d. per acre extra.

Drilling for Corn—Double Mould-board Plough.

	s.	d.
Wages, 1 man	4	6
Horses, 2 at 1s.	2	0
Use of plough, say	0	6
	7	0

for 6 acres, or 1s. 2d. per acre.

Dropping Corn.

	s.	d.
Wages, 1 man	4	6
Horse, 1 at 1s.	1	0
Use of machine, say	1	0
	6	6

for 6 acres, or 1s. 1d. per acre.

Cultivating Corn (Double).

	s.	d.
Wages, 1 man	4	6
Horses, 2 at 1s.	2	0
Use of machine, say	1	0
	7	6

for 6 acres, or 1s. 3d. per acre.

Hilling Corn.

	s.	d.
Wages, 1 man	4	6
Horses, 2 at 1s.	2	0
Use of machine, say	1	0
	7	6

for 6 acres, or 1s. 3d. per acre.

Harvesting Wheaten-hay.

	s.	d.	
Wages, 1 man	4	6	Cost of reaper and binder, £40; life, 4 years, equals £10 per annum of 30 working days, or 6s. 8d. per day.
Horses, 3 at 1s.	3	0	
Machine depreciation ...	6	8	
Twine for 2-ton crop, 5 lb., at 6d.	2	6	
Oil, approximate	0	4	
	17	0	for 9 acres, or 1s. 11d. per acre.

Cutting Stalks (Corn).

	s.	d.
Wages, 1 man	4	6
Horses, 3 at 1s.	3	0
Use of machine, say	1	6
	9	0

for 6 acres, or 1s. 6d. per acre.

COST of Producing Corn on Richmond Lowlands, using latest machinery in every case.

	£	s.	d.
2 single-furrow ploughings, at 7s. 6d....	0	15	0
3 harrowings, at 8d.	0	2	0
2 rollings, at 8d.	0	1	4
Drilling, at 1s. 2d.	0	1	2
Dropping, at 1s. 1d.	0	1	1
Seed	0	0	6
Cultivation, 3 times, at 1s. 3d.	0	3	9
Hilling	0	1	3
Pulling	0	4	0
Drawing to shed	0	2	0
Rent, say	1	10	0
	£3	2	1

	£	s.	d.	
Forward	£3	2	1	
Yield, say, 50 bushels.				
Husking, at 1½d. per bushel	0	6	3	
Thrashing and bagging, at 1½d. per bushel	0	6	3	
Drawing to station, at 1d. per bushel	0	4	2	
	£3	18	9	
Cutting up corn stalks	0	1	6	
	£4	0	3	per acre.
50 bushels of corn, at 2s. 6d., at station ...	6	5	0	
Profit (to cover cost of manure, if any) ...	£2	4	9	per acre.

Cost of Producing a Crop of Wheat for Hay in the Hawkesbury District.

	£	s.	d.
2 single-furrow ploughings, at 7s. 6d.	0	15	0
3 harrowings, at 8d.	0	2	0
2 rollings, at 8d.	0	1	4
Drilling crop with machine	0	1	4
Seed, 1¼ bushels, at 3s., pickling, 6d.	0	5	0
Cutting with binder	0	1	11
Stooking	0	1	0
Drawing to shed, 2 tons, at 2s.	0	4	0
Rent, say, ⅔ year, at £1 10s.	1	0	0
	£2	11	7
Crop, 2 tons, at £2	4	0	0
Profit, and to pay for manure, if any ...	£1	8	5

Cost of Producing Wheat for Grain in a Western Wheat Area.

	£	s.	d.	£	s.	d.
Ploughing (3-furrow)				0	4	4
Harrowings, 3 at 8d.				0	2	0
Rolling, 1 at 8d....				0	0	8
Drilling				0	1	4
Seed, 1 bushel at 3s., pickling, 6d.				0	3	6
Cutting with binder				0	1	11
Stooking				0	1	0
Drawing to shed and stacking				0	4	0
Thrashing and stacking, say				0	4	0
Winnowing and bagging				0	2	0
Rent, say				0	10	0
				£1	14	9
Yield, 16 bushels at 3s.	2	8	0			
1¼ tons of straw, at 12s. per ton..	0	15	0			
				3	3	0
Profit to pay for manure, if any, and carting to station according to distance				£1	8	3

NOTE.—These prices are based on actual costs—that is, the profit is not stated as made on the operation of ploughing, seeding, &c., but is included in the result. Costs must vary according to—

1. Local conditions of labour, &c.
2. The state of ground and weather.
3. Price of feed and seed (if bought).
4. Care in handling machinery.
5. Area sown.
6. Class of implement employed.

The cost of raising any other crop can be easily estimated from these figures.

Stack Ensilage.

R. W. PEACOCK,
Bathurst Experiment Farm.

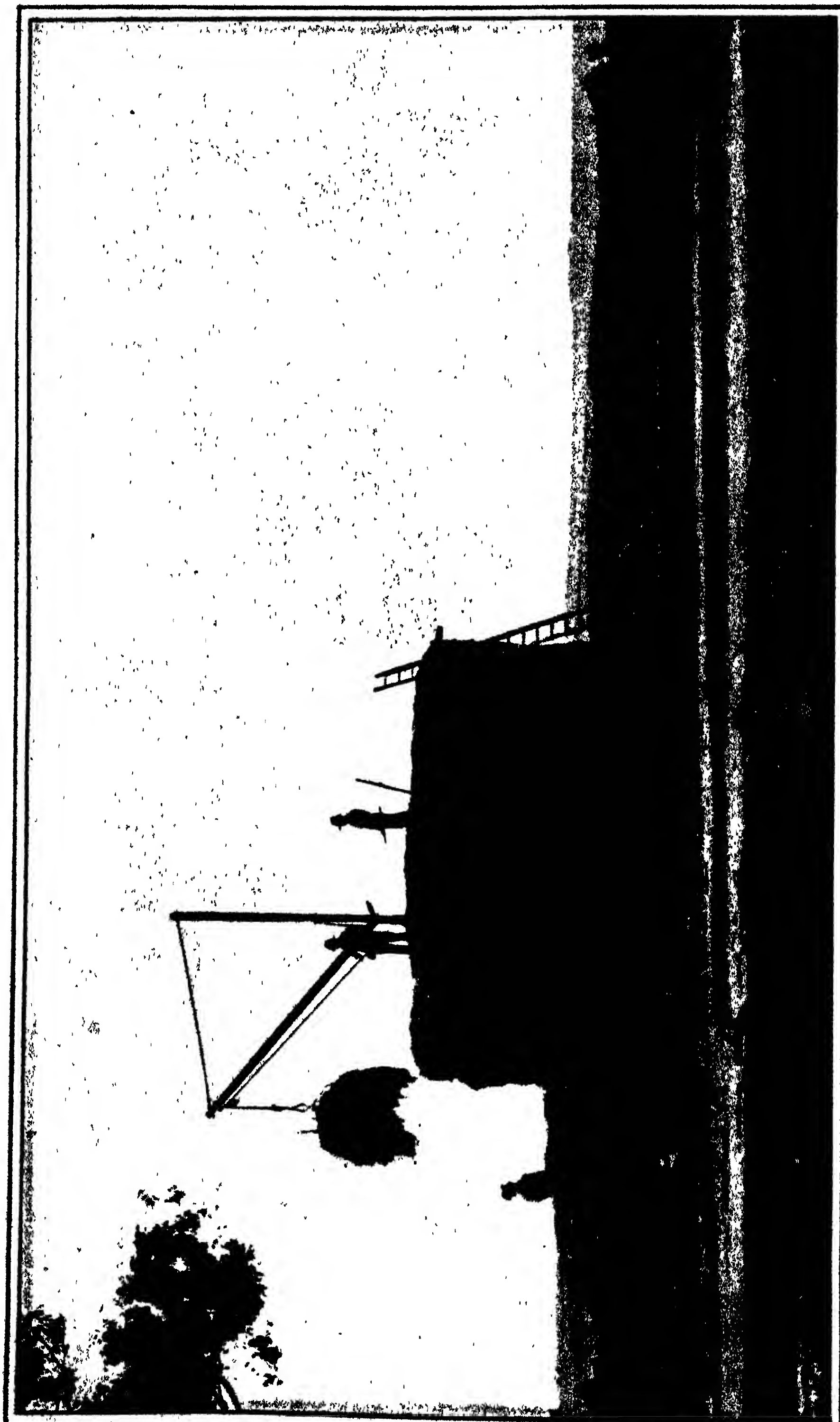
In building ensilage stacks the labour may be materially reduced by using a derrick as shown in illustration. The clutching dogs are made to tighten upon the material as the horse pulls. The points should be made of steel and polished so as to enter readily.

Four stout posts at either corner of the stack would assist in keeping it plumb. The material should not be allowed to jamb at the posts to interfere with its settling. Stacks of green material very often tilt over to one side on account of uneven drying. The wind may dry one side more than the other and prevent its settling uniformly. A stack may fall over if not watched. A tarpaulin may be hung against the side to protect it from the wind. Water also could be applied to the drying side. Large quantities of fodder may be cheaply and effectively conserved by means of stacks. Constant pressure should be applied in the form of stones, bags of sand, or timber, whichever are the most convenient to minimise the waste at the top. A covering of some material should be provided. In dry districts pits are preferable to stacks. The drying winds cannot affect the ensilage in the pits. Pits are economically excavated by tank-sinking appliances. After they are filled, earth to provide pressure and protection is scooped upon the top. Such methods are suitable to the pastoralist rather than the farmer. Large quantities of fodder may be economically conserved by such means.

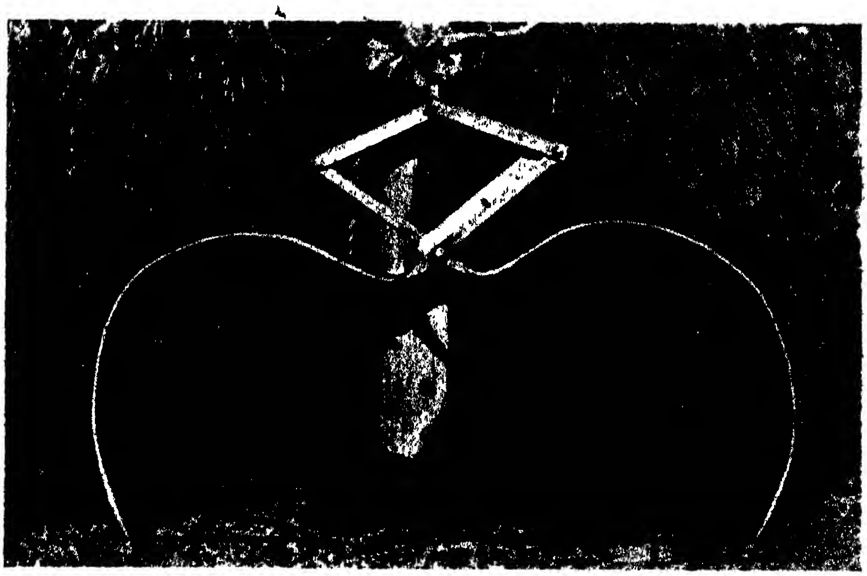
Ensilage from Dry Maize Stalks.

That dry maize stalks can be turned into good ensilage was demonstrated at the Bathurst Experiment Farm during the past autumn. Forty-eight acres were grown upon the uplands. Off a proportion the cobs were pulled upon the immature side so that the stalks could be fed to advantage to the dairy cattle. The majority of the stalks were perfectly ripe. These with a proportion of green lucerne were put through the ensilage cutter together and elevated into a tub-silo. As the silo was being filled a mixture of molasses 25 lb., salt 5 lb., and water 100 gals., was sprayed by the ordinary orchard spray pump over the mass and thoroughly mixed. Twenty casks, holding 100 gallons, were thus added. The total quantity of silage was 83 tons, allowing 40 lb. per cubic foot. This was of excellent quality, upon which the dairy cows have kept up their supply of milk throughout the cold weather whilst fed solely upon it. The percentages of the various constituents were :—

Maize stalks	69·64	per cent.
Green lucerne	19·28	,,
Water added	10·76	,,
Molasses	·27	,,
Salt	·05	,,



Building Ensilage Stack with the aid of Derrick and Clutching Dog.



Clutching Dog used for Building Silage Stack, Bathurst Experiment Farm.

A larger proportion of liquid could have been added to advantage. The whole should be thoroughly mixed or otherwise the dry patches may become mouldy. The stalks should be cut as soon as possible after the ripe maize is pulled, to conserve their nutriment. The above method of ensiling dry maize stalks can be confidently recommended.

The following is an analysis of the fodder by Mr. Guthrie :—

	Moisture	68·39	per cent.
	Ash	1·09	„
	Fibre	6·56	„
	Albuminoid	5·06	„
	Carbo-hydrates	18·30	„
	Ether extract (fat or oil) ...	0·60	„
		100·00	„
	Nutritive value	24·7	„
	Albuminoid ratio ...	1 to 3·8	„
Remarks	Volatile acidity as acetic ...	1·06	„
	Fixed acidity as lactic ...	2·42	„

Importation of Live Stock into the Philippine Islands.

The Minister of Agriculture is in receipt of a communication from Mr. J. B. Suttor, the Commercial Commissioner in the East for New South Wales, forwarding a copy of an Order issued by the Government of the Philippine Islands in connection with the inspection of live stock imported into those Islands. The Order reads as follows:—

General Order No. 10. Bureau of Agriculture, Manilla, June 5, 1908.

RULES AND REGULATIONS FOR THE INSPECTION AND SHIPMENT OF LIVE STOCK.

NOTICE.—These Rules and Regulations are based on Act No. 1760 of the Philippine Commission. Copies of this Act, in English or Spanish, will be furnished by the Director of Agriculture to anyone making application for the same, either by letter or in person, at the Office of the Bureau of Agriculture, Orient Building, Manilla.

RULE I.—IMPORTATION AND QUARANTINE.

1. Except as hereinafter provided, all cattle and carabaos imported into the Philippine Islands from other countries where dangerous communicable animal diseases are known to exist, and *en route* to these Islands, for a period of not less than ten days, shall be subject to a total quarantine of not less than ten days from the date of embarkation at the port of origin.

2. Until such time as the Bureau of Agriculture may be able to provide quarantine corrals and sheds in which to keep such animals during the period of quarantine, the present arrangement will be continued, and they will be quarantined in suitable corrals or sheds provided by their owners.

3. Nothing in this, or any other of the rules herewith promulgated, shall be construed as prohibiting the slaughter of cattle for meat when they are in good health, or as requiring the Director of Agriculture to liberate any animals at the expiration of the ten days quarantine, if, in his judgment, dangerous communicable animal diseases are liable to spread to other points in the Philippine Islands, by permitting the shipment of such cattle or carabaos beyond the port of entry at the expiration of the quarantine period.

RULE II.—IMPORTATION OF DISEASED CATTLE PROHIBITED.

1. In view of the fact that during the past year nearly all shipments of cattle to the Philippine Islands from Chinese territory, and especially from the port of Hongkong, have been infected with dangerous communicable diseases, as defined in Section 2 of Act No. 1760, notice is hereby given that on and after June 20, 1908, the Director of Agriculture will no longer use the discretion given him by Section 3 of the said Act to allow the further importation of cattle suffering from such diseases, except as hereinafter provided.

2. Whenever a shipment of cattle arriving in a port of the Philippine Islands from any foreign port proves to be infected with any dangerous communicable animal disease, notice will be given immediately in writing to the local consignee, and by cable, if practicable, and when not practicable, in writing, to the authorities of such foreign port.

3. Whenever three successive shipments arriving in the Philippine Islands from any foreign port prove to be infected with any dangerous communicable animal disease other than anthrax, notice will be given immediately in writing to the local consignee, and by cable, if practicable, and when not practicable, in writing, to the authorities of such port, that landing permits will not be granted for further shipments from such port containing animals suffering from such disease, save only for shipments which may have actually left such port prior to the receipt of said notice.

4. Whenever any shipment arriving from any place proves to be infected with anthrax, landing permit will be refused for that entire shipment, and for all perishable articles, such as litter, bedding, and other material which may have become infected and serve as a means of bringing the infection of this disease ashore if permitted to be landed.

Rule III.—Shipping Permits Required from Points Declared Infected.

1. In accordance with the provisions of Section 5 of Act No. 1760, the Secretary of the Interior has declared the ports of Manilla, Iloilo, and Cebu infected with dangerous communicable diseases of animals.

2. Hereafter, during the continuance of such infection, no animals will be permitted to be shipped, driven, or otherwise taken beyond the city or municipal limits of these ports except when accompanied by certificates issued in accordance with said section, as hereinafter provided.

3. The public is warned that Section 4 of Act No. 1760 is in full force at all times. Persons violating its provisions do so at their peril.

Rule IV.—Shipments from Infected Points Limited.

1 Hereafter, so long as any dangerous communicable animal disease continues to exist in any place which has been declared by the Secretary of the Interior to be infected with such disease, permits for the shipment of cattle from such place to other ports or places in the Philippine Islands will not be issued except when such cattle are destined to a port or place within the Philippine Islands where the Bureau of Agriculture maintains a system of veterinary inspection, or is prepared to establish such a system, or where a general outbreak of such disease is known to exist.

2. The Director of Agriculture will establish and maintain systems of veterinary inspection, so far as the force of employees at his command will permit, at any place in the Philippine Islands, upon presentation of satisfactory evidence that the number of animals to be shipped to such place from ports or places declared to be infected with dangerous communicable animal disease, is sufficient to justify him in so doing.

Rule V.—Certain Classes of Animals Exempt.

The following classes of animals are exempt from the provisions of these rules and regulations, in accordance with the limitations stated for each class:

1. Cattle which have been permanently immunized against rinderpest, or which have had rinderpest and recovered from it, when accompanied by a certificate issued by authority of the Director of Agriculture to this effect, and in which the marks and brands are so given as to enable anyone positively to indentify each individual animal, shall not be subject to quarantine on account of rinderpest.

2. Animals imported from countries where dangerous communicable animal diseases were not prevalent at the time of embarkation, and which have been on shipboard more than ten days, and found to be free from such diseases, may be transhipped without landing, and transported to any part of the Philippine Islands.

3. Animals imported from countries where dangerous communicable animal diseases were not prevalent at the time of embarkation, arriving at a port declared by the Secretary of the Interior to be infected with dangerous communicable diseases of animals may, if found to be free from such diseases on arrival, be transhipped without landing, and transported to any part of the Philippine Islands, the provisions of Rule I to the contrary notwithstanding.

4. Animals actually employed in road or field work may be allowed to leave and enter any city, municipality, province, township, or settlement where dangerous communicable animal diseases have been declared by the Secretary of the Interior to exist, whenever in the opinion of the Director of Agriculture they can be permitted to do so without danger of contracting and spreading such diseases, and under such rules as he may prescribe.

5. Native cattle shipped from one port or place to another within the Philippine Islands, when free from dangerous communicable animal diseases, and so handled as, in the opinion of the Director of Agriculture, to prevent them from contracting and spreading such diseases, shall not be required to be certified by the Director of Agriculture.

Repeal of Orders in Conflict.

The live stock quarantine order issued by the Secretary of the Interior on November 27, 1907, General Order No. 9, issued by the Director of Agriculture on April 30, 1908, and all other orders or parts thereof which are in conflict with these rules and regulations, are hereby repealed

Eradication of Weeds.

J. H. MAIDEN.

It is gradually becoming known that we have now a Weeds Law. What will be the extent of its power for good is, of course, a matter for the future, since all legislation of this kind must be experimental. Municipalities and Shire Councils are empowered to frame regulations under which landowners must destroy certain specified weeds on their holdings.

People are thus becoming educated as to what weeds are, and their responsibility in regard to them. I think that the display of indignation on the part of some folks is an excellent sign; public attention is evidently being aroused; we have been slumbering too long in regard to vegetable pests.

If people could only be educated to destroy the single or little plants as they appear as outliers much good would be done. We see large paddocks with one little Sweet-briar, one Prickly Pear, one Noogoora Burr, &c., and owners are too lazy to pull them out when few and small. They then fruit, are spread by birds and cattle, and the pest reigns.

There are two ways of dealing with such pests as Noogoora Burr* - (1) Pull it up by the roots and burn it; but this advice can usually only be followed where it first appears in a district. (2) Spray with arsenical solution; this may or may not kill it entirely—this depends on its accessibility and the thoroughness of the workman—but much of the plant will die and can be readily fired.

The same advice applies to Bathurst Burr.

The Noogoora and Bathurst burrs are chiefly spread by the burrs clinging to animals. The ground is often saturated with them, so that when the parent plant is destroyed see that the progeny are dealt with. Weed eradication means incessant care.

Thistles cannot be kept out of a paddock in many cases; their feathery seeds fly for miles. Some thistles die out naturally; one, at least, is a good fodder-plant. So that the taking of repressive measures in regard to some thistles is not unattended with difficulty, and is even undesirable and sometimes impossible.

Now let us turn to Blackberry and weeds of that class, such as Sweet-briar. In Europe it is a common thing to use bill-hooks for Blackberry, &c., then carry out the stems in bundles and burn them. Then sheep, goats, horses, and cattle are folded on the land containing the stumps; they eat the luscious young spineless shoots readily. Briar can be treated in the same way.

Another method is to spray with arsenical solution, and in a few days, when the leaves and stems are more or less dead, the mass is fired. Then cut away the stems which are left and burn them in convenient heaps. If the roots can then be mattocked out in summer, that would be well, but the less expensive way, in most cases, is to allow stock to get at the plants as they sprout again, and if the sprouts be constantly eaten down the plants die of exhaustion.

Briefly, my advice, therefore, is—

1. Take weeds seriously, never let them get a hold, and inquire as to the nature of all new plants which make their appearance.
2. Spray or use the brush hook and fire.
3. Put sheep or Angora goats (if available) on sprouting stems or young seedlings. The above animals for preference.

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* See the *Agricultural Gazette* for 1899, p. 1043.

Drying Apricots and Peaches.

W. J. ALLEN.

These fruits can be grown in almost any part of Australia, while the warmer and drier portions of the States are usually the most suitable climates for the production of the best fruits for drying purposes.

It is often found that fruit grown in the moist coastal districts is inclined to be rather full of fibre, while that of the drier climates is in almost every case quite free from this detrimental composition. Again, some varieties are more suitable than others for drying purposes, even when grown in the most favoured soil and climate, and it is satisfactory to know that some of our best apricots and peaches for drying are also some of the best for dessert and canning, and therefore, when it is possible to grow varieties combining all of these excellent qualities, one is tempted to ask why there are so many grown which are of little if any value for anything but dessert purposes. The earlier and more juicy fruits are seldom of any value for drying, while among the mid-season and medium late can be found the best varieties for this purpose.

We have thousands of acres admirably adapted for raising fruits suitable for drying, and also the climate necessary for producing the best dried fruits. In many of the interior districts the climate is so well adapted for fruit drying, owing to the absence of fogs and moisture in the air, that the drying process goes on day and night. This lessens the chance of moths depositing their eggs in the fruit, which is exposed for the minimum length of time, and has also the advantage of sun drying in place of using an evaporator, and the fruit drying quickly the trays can be emptied sooner than is possible in the more moist and cooler climates, thus enabling the grower to handle a large crop with fewer trays—a great consideration to all orchardists.

As soon as the fruit is cured it should be stored in strong calico bags, to prevent it becoming moth infested.

Heavy crops can usually be grown wherever irrigation can be practised, provided the soil is loamy, on which soils these fruits usually grow to perfection, and produce the heaviest crops. It can safely be said that there are many places in Australia where these fruits can be grown, and the products, when cured, are equal to the very best grown in any other part of the world.

There is usually a much greater demand for apricots than peaches in this and other countries, and it is to be regretted that while nature has been so generous in giving us all that can be desired in the way of soil and climate, that up to the present our fruit-growers have not made more use of these advantages in the production of greater quantities of the better quality of both fruits.

Great care must be exercised in the selection of varieties, as only those should be planted which attain a good size and produce a well-coloured fruit when cured. The following are among the best for the purpose :—

Apricots.	*Peaches.*
Mansfield Seedling,	Elberta,
Moorpark,	Lady Palmerston,
Alsace,	Early Crawford,
Hemskirke,	Comet.
Kaisha.	

These all yield good crops, and produce when cured a high-grade product.

Plant Required for Fruit-Drying.

1. Cases in which to handle the fresh fruit, such as peaches, apricots, prunes, apples, etc. Those which hold a bushel of fruit are the most convenient to handle. They should be made strongly so as to stand rough handling.
2. Where growers are operating in a large way, handling, say, from 5 to 25 tons of apricots daily, large sheets are required to place underneath the trees, so that fruit may be shaken off in place of picking it; which latter, however, is best for small quantities.
3. Good, sharp knives for use in cutting fruit, such as apricots and peaches, in halves. A knife somewhat similar to that used by shoemakers is about the best; but any knife with a short, sharp blade will answer the purpose. Also a pitting-spoon for removing the stones from clingstone peaches.
4. Trays for holding the fruit during the process of fumigating and drying.
5. A hand-barrow for use in carrying the trays to and from the pitting-shed, fumigator, and drying ground.
6. A wooden fumigator, in which to hold the trays during the sulphuring process.
7. Evaporator, where sun-drying cannot be altogether depended on.
8. Drying ground.

Apricot-Drying.

As previously suggested, the planter should choose and grow only those kinds which make a good, bright, clear-coloured, large fruit, and one which does not dry away too much during the process. To begin with, the tree must receive, from the time of its planting, the necessary care and attention to enable it to produce a good crop of the very best fruit, both for quality and size. Small undersized fruits are more expensive to handle, they lose more in drying, are more difficult to dispose of, and they sell at about one-half the price of fine, bright, even fruit. This necessitates systematic and judicious pruning and thinning. If it is seen that a tree has set too much fruit, or more than it can possibly develop properly, pick off or thin evenly over the whole tree, leaving only such quantity as the tree will properly develop.

This thinning should be done during the latter part of October, and if the grower finds that there are still too many apricots left on the tree, he may, if he thinks advisable, remove more just when the stone in the fruit is hardening, either the first or second week in November. It is not unusual for some of the fruit to drop at this period, in which case the second thinning may not be found necessary.

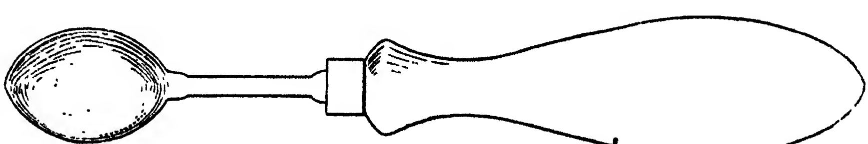
Girls cutting and pitting Apricots for drying at Wagga Orchard.

If irrigation is carried on, and the climate is very dry, do not be afraid to irrigate the trees at the time of ripening if they appear to require it, as a little neglect at this particular time may make a great difference in the quantity and quality of the dried fruit.

Tray of Peaches ready for fumigating.

In a cool, moist climate I would recommend the orchardist to pay particular attention to his cultivation, in order to keep the soil in proper tilth, in which condition it retains the greatest amount of moisture, which is a necessity for the well-being of the tree, and the consequent production of fruit. To make the best dried fruit, allow the apricots to hang on the tree until they are

perfectly ripe, but not over-ripe, or so that they cannot be cut in halves with a sharp knife and still retain their shape. In harvesting apricots for drying at Riverside, California, we had a gang of four men with a sheet placed underneath the tree ready to receive the fruit. The tree was then slightly jarred with forked poles, which are carried, one by each man, and when all the ripe fruit was shaken the sheets were taken up, and the fruit gently poured into cases holding about 35 lb. each. With a large staff, such as we had there, of about 100 pitters and 30 pickers, we had apricots cut and in the fumigator two hours after they were shaken from the tree, so that any slight bruises were not noticeable on the dried fruit. When the fruit is fairly soft, pick it carefully into cases; this will, in all probability, necessitate going over the trees several times. As soon as possible have the cases carted to the cutting-shed, where the fruit should be carefully and evenly cut in halves (not pulled apart) and the pits removed. Place evenly on the trays with the cut side up, and as soon as possible remove each tray to the fumigator, where it may remain, with the door closed, until the fumigator is sufficiently full to start the sulphur burning. This is of the utmost importance, as when once the fruit has been cut it must not be exposed to



Spoon for removing pit in Clingstone Peach.

either sun or wind. When everything is ready, place sufficient sulphur or brimstone to fill the room with the fumes for about three hours (1 lb. to 300 cubic feet); but, if possible, allow the fruit to remain in the sulphur-room from eight to ten or twelve hours, or until the cup (that is, the depression whence the pit was removed) is full of juice. It can then be taken out and immediately placed either in the sun or in the evaporator (as the case may be). If in the evaporator, do not place the fruit in the hottest part to begin with, but gradually work from the cooler to the hotter part (say), starting at that part which is 140 degrees, and finishing off at 180 or 212 degrees Fahr., dry heat. In this way the fruit will dry in from fourteen to eighteen hours; but the greatest care must be taken not to allow it to burn, and some practice will be required to tell when it is just dry enough.

If the fruit is to be dried in the sun, use wooden trays, 2 feet x 3 feet, which are made for the purpose, with a 2½-inch cleat at both ends. These are easily handled, and can be used in connection with all fruits. In cutting the fruit and placing it on the trays, place it on the top part, or so that the cleats at the ends will be resting on the ground, thus allowing a current of air to pass underneath, which assists in the drying process. If the weather is hot, which it usually is about Christmas-time, it will take from two and a half to three and a half days to dry the fruit, which will

require to be sorted over, so that any which is not quite dry may be allowed to stand for another half-day or so. The dried fruit should be taken from the trays, and put into clean calico bags immediately and securely tied, so that the moths may not reach it. When sorting over in the above manner, any fruit which is small or of bad appearance should not be mixed up with the good, but removed and stored in separate bags, and marked as inferior; while the good can also be marked accordingly. When the fruit is dried and bagged it should be at once stored in a cool, dry place; if exposed to heat, it will become hard, lose in weight, and deteriorate in quality.

Should, by any mischance, the moths have got into the fruit and deposited their eggs therein, an effectual means of cleaning or ridding such infested fruit is to dip it into boiling hot water for a few seconds, and then spread on trays and allow to dry by exposure to the sun's rays for a few hours.

Fruit thus dipped will not keep its colour long, consequently it should be disposed of as quickly as possible. Its appearance would be improved if it was put in the fumigator again and allowed to remain about one and a half hour before packing.

Peach-Drying.

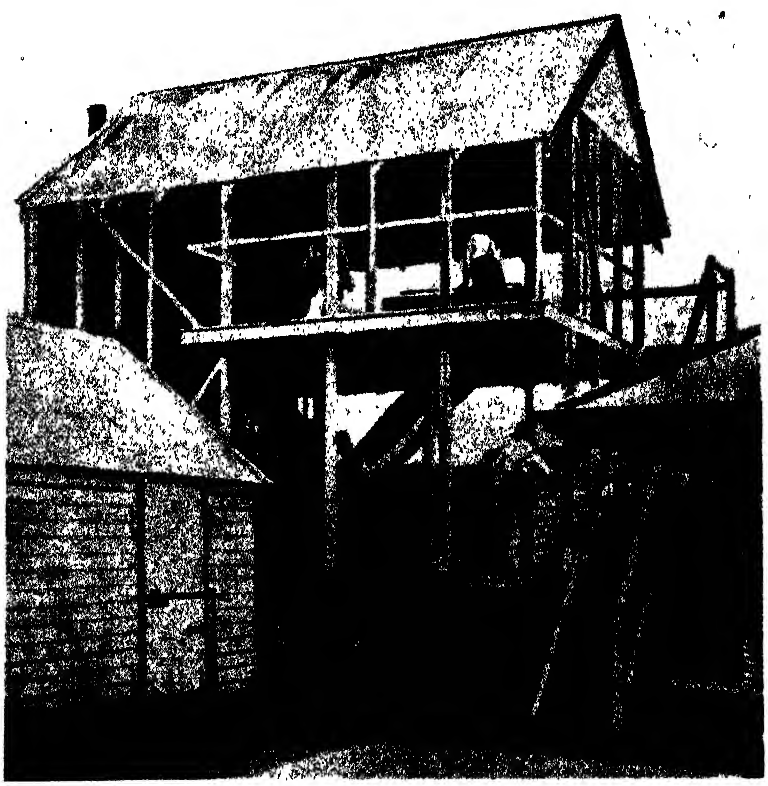
The process of drying peaches is very similar to that followed with apricots, but there are so many hundreds of poor varieties grown that it is very difficult to find peaches that make a first-class or commercial dried fruit. A freestone is really the only variety to grow for drying purposes, and one with a firm, yellow flesh, not too juicy, and above medium size. A peach of this description will make the very best commercial article, and one which, when properly dried and packed, would bring the highest price. A clingstone peach will dry, but will not sell so readily, and brings a much lower price. It is true it will not dry away so much, but with the market as it is, with keen competition from America, it will not pay the grower to place an inferior article on the market, for three reasons, viz.:—(1) Inferior fruits placed on the market tend to lower the prices of good fruits; (2) they sell at such low prices that it barely pays the grower for his work in picking, curing, packing, and marketing; (3) they are usually the last fruits on the market to be sold, and very few wholesale dealers care to handle them, and, in consequence, will accept almost any offer to get rid of them.

I have already named certain good varieties which are especially worthy of notice.

Although in California peeled peaches have always brought a much higher price than the unpeeled, they have not, in Australia, sold for sufficiently more to pay the grower for the extra trouble of peeling, and in consequence nearly all dried peaches found on the market are unpeeled. With some varieties it is found that the skin will slip off quite easily with a slight pressure of the thumb and finger immediately after the fruit has been fumigated, while other varieties require the use of a peach-peeling machine.

For drying, the peaches should be cut evenly in halves, placing them on the trays with the cut side up, in every way similar to the apricot, except

that, at the most, they only require two hours' fumigating; but if desired they may remain for a longer time in the sulphur-room, by opening the doors and allowing the air to circulate freely through the trays, after which they are placed in the evaporator, or in the sun, as the case may be, and exposed to the same temperature as the apricot. They should be removed from the tray while quite pliable, and not allowed to over-dry, then tied in calico bags and stored in a cool, dry place until required for packing. If peaches are very uneven in size, it is best to keep the different sizes together on the trays, as they dry more evenly than if the large and small fruits are mixed on the same tray.



Fumigator on the left. Evaporator at Wagga Orchard.

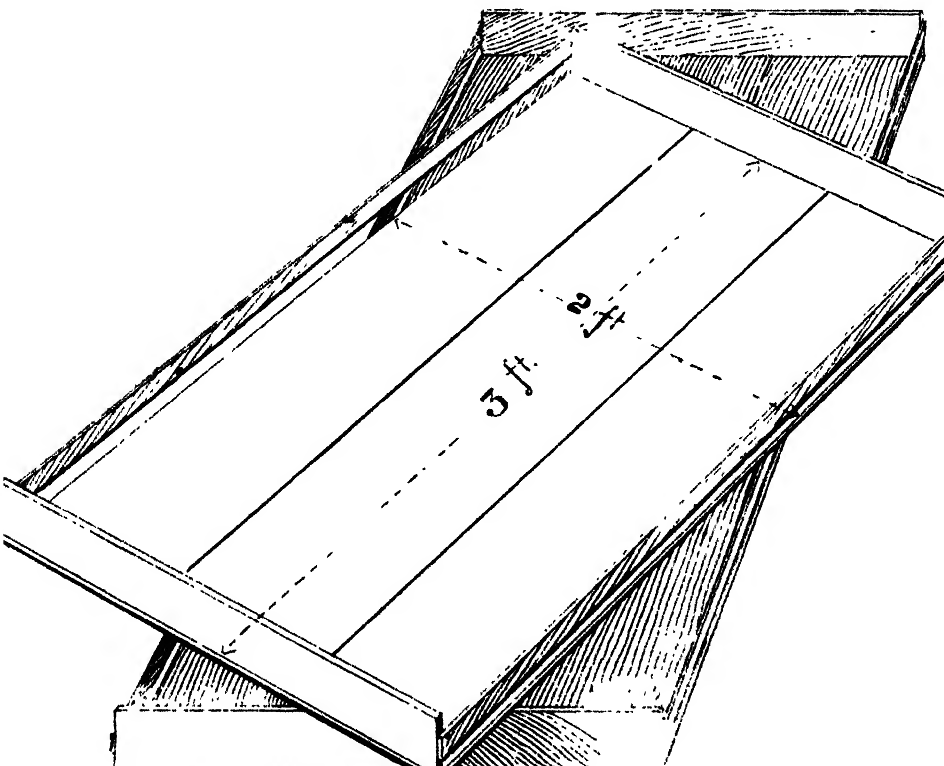
Fumigating and Sulphuring.

The fumigator should be built handy to the cutting-sheds and drying-ground. It should be large enough for the requirements of the orchard, but I would not recommend building a room so small that it would not hold at least a hundred trays—that is, unless the grower has only a few trees, when almost any fairly air-tight box capable of holding a dozen trays would answer the purpose.

A good-sized room for an ordinary orchardist is one 9 feet by 10 feet, and 6 feet 6 inches high on the inside, built of tongued and grooved boards, and

put together with white lead. Any small cracks can be filled up with putty, and if the room should be found to leak it can be papered inside. Fruit sulphured in a large room rarely ever tastes of the sulphur, and this is the great advantage of having a good-sized room, even though it takes a little more sulphur. A room such as this will hold 300 trays quite easily, and requires about 2 lb. of sulphur.

If the orchardist has only a small quantity of fruit to handle, this could be sulphured by taking a good-sized packing-case capable of holding a dozen trays, paper it inside, and, having stacked the trays one on top of another,



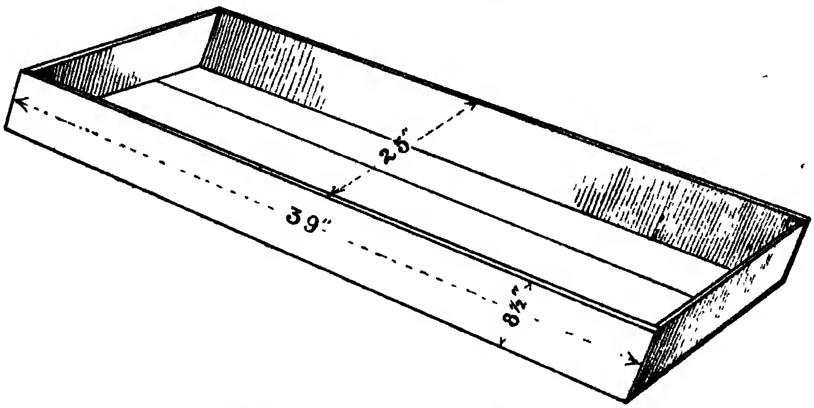
Drying-tray.

place the box over the top of the whole. This should be placed partly over a hole in the ground, previously dug for the purpose, and about 2 feet 6 inches deep, wherein the sulphur is to be burnt in a small iron pot. When the sulphur is lighted, cover the hole closely on the outside with a piece of iron or board, so that the fumes cannot escape.

Drying-Trays.

These are made with either three or four boards. I prefer the three boards, as there are not so many cracks, which is an advantage in curing small fruits such as sultanas, currants, &c., and they appear to hold together better than the four-board tray.

A good tray is made as follows:—The ends of cleats are made $2\frac{1}{2}$ inches wide, and $\frac{7}{8}$-inch thick; the three boards, $\frac{3}{8}$-inch thick, are then nailed securely on these cleats by driving four nails in each end, nails to be 2-inch round wire with flat heads; each tray to have a strip about $1\frac{1}{2}$-inch wide



Sweat-box used for handling dried fruits.

by $\frac{3}{8}$ inch thick on sides, nailed to ends. Such a tray as this is useful for any fruit-drying in the sun, and can also be used for storing lemons and oranges by placing in sweat-boxes with a layer of fruit on each.

Packing dried fruits at Wagga Orchard.

In drying fruit, these trays, when necessary, can easily be stacked one on top of the other, and the stack covered with two empty trays to keep the rain off.

These trays should not cost more than from 8d. to 9d. each by the thousand in Sydney.

Drying-Ground.

A lucerne paddock makes an excellent drying-ground, but the fruit dries more slowly than it does on the dry ground; any clean, unbroken ground may be used instead. This, of course, has its disadvantages, as the dust rises easily, and great care should be taken to keep the ground sprinkled wherever it has to be walked over. By taking this precaution the fruit can be kept quite clean, and it dries more quickly than when the trays are spread on lucerne.

In spreading the trays do not leave roadways between them, but place them side by side, so that the whole ground is covered, and thus there are only the outside trays to watch.

Evaporator.

Up to the present this means of drying has not been largely used, but there are a few small home-made evaporators in use, which are turning out good samples of dried fruits and vegetables. In our warmer climates these are seldom brought into requisition, but in our moist coastal and cooler districts they are very necessary.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE.

Summary for July, 1908.

Air Pressure (Barometer.)			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	Per cent. of year's Evaporation.
29·74	30·53	30·17	21·2	78·0	47·6	48·9	38	98	74	·152	2·121	1·914	4·3
1	16		24	20			14	17		23			

Rainfall ..										
Points	8½	4	1	1½	2¼	127	30	7½	1½	183¼ points.
Dates	9	10	15	16	21	28	29	30	31	

Mean for 16 years = 247 points.

Greatest daily range of temperature, 40·5° on 12th.

Frosts occurred on 17 days.

Wind ..	N	NE	E	SE	S	SW	NW
	4	10	2	1	3	5	6

W. MERVYN CARNE,
Observer.

Rust in our Fruit Crops.

EDWIN CHEEL,
Botanic Gardens, Sydney.

THE rapidity with which these parasitic pests of our orchards and gardens are increasing, necessitates prompt and efficient attention, to prevent the further spread of these fungous diseases, and in the hope that some united effort may be taken to impress upon the minds of the growers the vast destruction that is taking place each year among some of their most important fruit crops, I feel it my duty to call attention to the ravages that is being made through allowing the unchecked spread of these parasitic fungi.

Peach rust (*Puccinia Pruni spinosæ*, Pers.).

This is a disease which not only attacks our peach-trees, but also our plums, apricots, nectarines, and almond trees. It was first discovered in Queensland, in 1886, by Mr. H. Tryon, who forwarded the specimens to Baron von Mueller, who communicated them to Dr. M. C. Cooke for determination.

During the period from December, 1890, to April, 1894, Dr. N. A. Cobb published a series of "Contributions to an economic knowledge of Australian Rusts," which may be found in this *Gazette*. In these writings, Dr. Cobb records the discovery of peach rust at Springwood, Pennant Hills, Rookwood, and at North Shore, near Sydney. In 1891, Mr. D. McAlpine, Vegetable Pathologist to the Department of Agriculture in Victoria, issued a special report on this disease, which was published as "Bulletin No. 14." In 1895, a further paper was published by Mr. McAlpine, which appears in the proceedings of the Linnean Society of New South Wales of that year.

In this latter paper excellent plates are given, showing the structure and germinating powers of the Uredo and Teleuto spores found upon peach, nectarine, plum, apricot, and almond trees.

In Mr. McAlpine's paper attention is drawn to the spread of this disease in Victoria, as follows:—Goulburn Valley, Murray to sea coast, and from Rutherglen to Wangaratta. Specimens have also been collected in South Australia by Mr. J. G. O. Tepper, who forwarded them to Mr. McAlpine for identification.

Since the above records have been made, I have found this disease infesting the aforesaid fruit-trees in Sydney, Penshurst, and at Goulburn, and have recorded their occurrence at these localities in the proceedings of the Linnean Society of New South Wales for 1907.

The most unfortunate part about these parasites is, that they are purely microscopic, and as such, are rarely noticed by the growers, except by the few who have been trained to look for them. When they are visible to the naked eye, on the upper and lower surface of the leaves, in the form of little brownish coloured pustules, the damage is then actually done, and there is little chance of trying to remedy the evil done at this period of the disease.

The first noticeable signs of the disease may be seen about the latter end of December or early in January, when a yellowish appearance may be observed in the leaves. Following this will then soon be found the minute organisms which cause the symptoms mentioned above, which, when microscopically examined, will be found to consist of countless millions of spores, ready to be blown through the atmosphere, for an attack on the next year's crop.

Soon after the appearance of the spores, the leaves of the trees affected commence to fall prematurely; even as early as February I have found some of the peach-trees at Penshurst to be almost denuded of their leaves.

When one is reminded that February or March is but the end of the summer season or early autumn, it cannot but be admitted that this disease, which is the cause of the leaves falling off the fruit-trees prematurely, must have a very injurious effect on the constitution of the trees, as by the falling off of the leaves they are deprived of the most important organs of the plant, and as a consequence the crops for next year are seriously affected, either by the trees bearing no fruit at all, or only small quantities of an inferior kind.

It needs but little argument to prove that the enemies of cultivated plants are steadily increasing, and I think it can be easily shown that they will continue to increase so long as the conditions for which we are largely responsible, remain as they are at present.

Because our fungus foes are increasing, it does not follow that they should be regarded as a calamity, but it should be taken as a clear proof that we are progressing, for as Professor Bailey, an eminent scientist, has said: "Our enemies increase because cultivation induces changes of habits in wild organisms; because it presents an ever-increasing variety of food, or host plants; because the natural equilibrium or tension is destroyed." It follows naturally, that the more we try to improve our fruits, flowers, or vegetables, or to change the habits of these plants to suit our modern requirements, just so much more do we disturb the equilibrium in nature, and thus we must expect to burden ourselves with the work of maintaining these changeable conditions by more or less artificial means.

To enable growers of fruit or other crops, -not only in orchards but also in small gardens—to successfully cope with these diseases, it is necessary to first enlighten the growers, so that they may be able quickly and easily to identify the many diseases affecting their crops of fruit or vegetables.

At present there is no systematic attempt to put information into the hands of the practical tillers of the soil, and until this is done we cannot hold anyone responsible who may happen to have these diseases in his garden or orchard.

It is simply useless for one or two individuals to make an attempt to keep their fruit-crops free from these diseases when in the immediate vicinity their neighbours are careless and indifferent about the matter, and the only way to bring the results of the destruction of these minute organisms under their notice is to be fairly liberal in our supply of literature, giving the results of the discoveries of scientists, and probable remedies for the destruction of the diseases.

Another simple way to instruct the tillers of the soil would be for properly preserved specimens, representing the various phases of the diseases of plants,

to be distributed in convenient centres of the State. From these it would be seen at a glance of what nature the fungous disease was, and the effect they have upon the crops. Accompanying the specimens there should be copious notes in pamphlet form provided for distribution among *bonâ fide* tillers of the soil, giving as nearly as possible the time of appearance of the disease, and the proper time to apply remedies for checking the same.

If photographs could be obtained, showing the appearance of the plants affected whilst in a fresh condition, additional interest in the specimens would be the result, and the growers would be thus enabled to more fully understand the disease and its effect.

By a properly organised system of exchanges, between the principal centres of agriculture, horticulture, or fruit-growing districts, acting under instructions from a properly equipped scientific central office, a good collection of the various diseases could be built up in the districts most concerned, and with remedies to check the further spread of these, the result would be of immense value not only to the growers themselves but also to the State at large.

As a preventive measure to check the further spread of the peach-rust, the "New Form of Bordeaux Mixture" is strongly recommended, which consists of the following ingredients:—

Quicklime ..	4 lb. 6 oz.	Bluestone (Sulphate of Copper)	4 lb. 6 oz.
Molasses ...	4 ,, 6 ,,	Water	22 gallons.

Add the molasses to 13 gallons of water, then slake the lime and add 4½ gallons of water to form a milk of lime. Pour this slowly into the sweetened water, stirring briskly in order to mix intimately. Next, in a third vessel (which must be of wooden material) dissolve the bluestone, and pour this into the previous mixture and stir well.

The first application of the New Bordeaux Mixture for peach and plum rust should be immediately after pruning, say, July-August.

The second application should be applied just before the buds burst. A third application should be applied when the leaves are half developed. The application of this mixture is also beneficial if applied for *Peach-leaf curl.*

The application of potash manure is also very serviceable to check peach and plum rust.

Note by Editor.

In 1892 I investigated these fungous diseases—Peach-rust and Peach-leaf curl, also the Shot-hole in apricots, and experimented with Bordeaux mixture, which certainly diminished the pest. But the most efficacious remedy was undoubtedly found in adequately feeding the trees—100 peaches, nectarines and apricots—growing in sandy loam. I added one pound of sulphate of potash and half-a-pound of copperas (sulphate of iron) to the ordinary dose of six pounds of bonedust per tree, and these diseases absolutely disappeared in three years from the orchard. The subsequent years were notably dry ones, and, therefore, probably less favourable to the spread of fungous diseases; but the very healthy appearance of wood, leaf, and fruit of all the trees convinced me that the addition of the above materials to the manure generally used on sandy soils for fruit is advantageous. I found some varieties of trees much more liable to these pests than others, and certain nurseries famous, or rather infamous, for sending out young trees badly infested. -H.C.L.A.

Edinburgh and East of Scotland College of Agriculture.

Lectures on the Meat Industry.

The absence of any systematic instruction in connection with the meat industry has often been remarked, and, when it is borne in mind that the use of meat as food is universal, this is all the more to be wondered at.

There is scarcely any trade which does not see that its members have opportunities for studying the technical details of their business, and such an industry as butter-making, which, like the meat industry, is only a development of agriculture, occupies the principal place in the syllabuses of our agricultural colleges.

There is every reason why the meat industry in all its multifarious branches should take as high a place and should form the subject of continuous and systematic study: and at the moment there seems to be a general desire on the part of those most interested, namely, the meat traders themselves, that such opportunities should exist.

There has not, however, so far been any organised attempts to translate this feeling into a definite project, and it is therefore interesting to know that a scheme has just been arranged whereby education in connection with the meat trade will, for the first time in the United Kingdom, be placed upon an academic basis. This scheme owes its inception to Professor Robert Wallace, of Edinburgh University, and Principal of the East of Scotland College of Agriculture, Edinburgh. It is at the latter place that it is proposed to inaugurate the scheme by the establishing of a lectureship on the meat industry. This has now been practically arranged, and the lecturer appointed is Mr. Loudon M. Douglas, whose writings in connection with the meat industry are well known.

The series of lectures arranged will take place during next winter, and will embrace references to the history of the meat trade and its modern developments, together with detailed accounts of the various departments of the industry, the construction of abattoirs, the laws affecting the handling of meat, the diseases of animals used in the meat trade, pickling, preserving and otherwise utilising meat, with an account of the chemistry and bacteriology of the subject. Cold storage, in theory and practice, will also form the subject of many references.

On the whole, the course proposed will aim at giving a thorough account of the industry, so as to form the introduction to the higher study of the subject in future sessions.

As this is the first attempt of the kind which has been made, many will view it with great interest, and more especially those who may contemplate the organisation of a similar scheme in their own localities.

Any further information may be obtained from Mr. Loudon M. Douglas, East of Scotland College of Agriculture, Edinburgh, who will also be glad to hear from those in sympathy with the scheme, wherever they may be.

It may be stated that the lectureship is supported financially by the Edinburgh Master Butchers' Association, whose President, Mr. Thomas G. Fisher, together with his colleagues, Mr. John Gray, V.P., and Mr. Brydon-Hogg, D.C., have, with many other members of the trade, taken a keen interest in the matter throughout. The Board of Education will also contribute their share of the expense, as will also the East of Scotland Agricultural College, Edinburgh.

Rib-grass or Plantain.

With reference to the fodder value of Rib-grass, referred to by Mr. Maiden in his article in the July issue, Mr. C. W. Bowyer-Smijth, Sutton Forest, writes:—"We look upon it as one of the very best milk producers, and I am sowing it now at my dairy farm, largely mixed with other pasture grasses. Of course, we arrive at these conclusions in a rough and ready way, but we have abundance of it in our paddocks and we see the cows eating it greedily, and at the same time they give us abundance of rich milk, and to us the inference is irresistible. I have lately been sowing the following mixture of grasses where I have been burning off, viz.:—

Rib-grass	18 lb.
Paspalum	18 ,,
Cocksfoot	18 ,,
Mixed Clover	4 ,,

Seed is merely sown on the burned patches, and the ashes well raked over to cover the seed.

The Spraying of Fruit Trees.

We are in receipt of a booklet, "The Spraying of Fruit Trees," from Messrs. Anderson & Co., Sydney, describing experiments conducted in England with two spray-fluids manufactured by Messrs. Wm. Cooper & Nephews, Birkhamsted, England. The efficacy of these fluids, known as V_1 and V_2, is being tested by the Department of Agriculture. Full reports will be published.

Export of Grapes to England.

The Department of Agriculture received advice from the Agent-General's Office, London, regarding the excellent prices recently obtained for a shipment of grapes from Western Australia. The flavour of these grapes was pronounced by experts to be equal to that of the best English hot-house varieties. The variety which carried best was the Black Malaga. The white grapes, however, did not stand the journey so well, because they were packed when they were too forward. The temperature in the cool chamber of the vessel, about 40° Fahr., had been judged to a nicety, but the bunches were nearly all packed in cork dust, and the trouble was that when they were lifted out, the cork-dust packing adhered to the fruit and could be removed only with difficulty.

Mr. B. Emanuel, of Covent Garden, who bought the whole consignment, says:—"If each bunch had been wrapped in paper as the Cape grapes are, they would have landed in perfect condition. The Australian fruit is much superior to and of a better class than the Cape variety, and if the packing is well looked after at the other end there is a big future for Australian grapes in this country."

The grapes commanded a ready sale, and made from 8s. to 14s. a case, averaging from 12 lb. to 18 lb.

In connection with the above, Mr. Blunno, Viticultural Expert to the Department, reports as follows:—

The variety mentioned as carrying best, namely Black Malaga, is known here by this name. We have this variety at the Viticultural Station, Howlong. It is not grown by private table-grape growers, because so far they have been satisfied with the local market. Table-grape vineyards are all more or less small, proprietors have not large means and cannot afford to take risks. The varieties grown are very few, viz.: Black Hamburg, Black Muscat Hamburg, White Sherry, and Muscat of Alexandria. These form the bulk. Towards the end of the grape season the Doradillo is marketed. A few years ago the Department of Agriculture imported several varieties of Chasselas; they are excellent table grapes for sweetness and flavour, they are the earliest grapes to ripen anywhere, but in New South Wales have not met with much favour, because the bunches and berries are not showy. However, of late, some vinegrowers who obtained vines from Howlong have devoted more attention to them, and for the last three grape seasons I have seen Chasselas in the shop windows before any other grape.

Besides the Malaga we also grow the Daria (Syn. Almeria) which is a shipping grape. There are other varieties of grapes in the collection such as Alicante, Trentham Black, Gros Guillaume, Syrian, Raisin des Dames, and Pearson's Golden Queen. The latter in normal seasons have a fairly elastic skin, and might carry over long distances, but we have made no experiments in this direction. Certainly they are not considered shipping grapes. Of the abovenamed varieties we have only a few vines of each, because they were planted for collection purpose.

Most of the varieties enumerated are rather late varieties, and at Howlong they ripen towards the end of March. In the county of Cumberland and in the Hunter River Valley, they would be about three to four weeks earlier.

The principal shipping table-grapes from Cape Colony are the Red and the White Hannepoort. We obtained a few cuttings of these last year and planted them at Howlong.

Grapes from California are marketed in New York, Chicago, and Boston, and the quantities are on the increase. The value of table-grapes marketed in the cities of the Eastern States of America was calculated at two and one-half million dollars in 1906.

The principal varieties grown and their respective proportions are:—

Flame Tokay	60 per cent.
Malaga	20 „
Muscat of Alexandria, Emperor .. ..., Ferrara .. ..., Cornichon ... ..., Black Morocco .., Sultanina	20 „

We have all the above varieties at the Viticultural Station, Howlong; the variety Ferrara is the Black Ferrar of our collection. The Flame Tokay grafts well on Rupestris du Lot in California; at Howlong we grafted it on Rupestris Martin, on which it does well. A table-grape grower at Corowa was so pleased with the samples of Flame Tokay which he had the opportunity of tasting at the Viticultural Station, that the following season (the season 1907) he took practically all the cuttings of Flame Tokay available for use as scions to graft on Phylloxera-resistant stocks.

Monsieur Marés believes that Flame Tokay is synonymous with Amar bou Amar, which in Arabic means "red father of the reds"; it originally came from Algeria. It was imported into California in 1857.

When in Need of Labour for Farm or Station,

Apply to—The Director, Intelligence Department, Challis House, Martin Place, Sydney.

Experienced farm labourers, strong useful lads, and married couples used to country life are arriving in New South Wales every week as assisted immigrants. The Intelligence Department sends them promptly to agriculturists and pastoralists who have applied for their services.

When on a visit to Sydney, farmers should make a point of calling at the Intelligence Department (opposite the General Post Office). Full particulars may be obtained, either by letter or personal call, as to how to bring out a relative or friend from the United Kingdom for £6 or £8. The Government Tourist Bureau, in the same building, explains, free of all charge, how to make the most of a short holiday.

A Simple Test to Distinguish Pure Wool Goods from a Cotton-Wool Mixture.

Weigh a sample of the mixed fabric, then boil for twenty minutes in a 10 per cent. solution of caustic potash or soda. This treatment removes the wool and a small percentage, possibly 5 per cent., of the cotton. Rinse, dry and weigh the residue, add 5 per cent., and the result is the weight of the cotton in the original sample. It is well to enclose the sample in a small sack of cheese-cloth while boiling it in order to prevent loss of the cotton.—*Dalgety's Wool Review.*

Apple Report.

Offices of Agent-General,
123 and 125, Cannon-street, London, E.C.,
26 June, 1908.

Sir,

I have the honor to forward herewith a short review on the season's apple trade by Mr. A. J. Brisley. This gentleman acts as surveyor of frozen produce for a number of leading firms in London, and has the opportunity of seeing the apples arriving from all the States.

I have the honor to be
Sir,
Your obedient Servant,
T. A. COGHLAN.

The Honourable the Minister for
Agriculture, Sydney.

I HAVE the honor to submit the following report on fruit shipped from Australia and Tasmania. The last fruit shipped for the season has now been delivered, and I regret to state that the net result has not been financially satisfactory to shippers. The number of boxes sent from Tasmania was about 485,000, and from Australia about 110,000 boxes. This was rather less from Australia as compared with 1907, and more from Tasmania.

The prices for apples from Australia averaged in this market all round about 1s. per box less than the Tasmanians. Apples arrived generally in good condition, although in the early deliveries I found bitter pit prevailing rather extensively, but later on this was not so noticeable. The quality was not quite so good, nor were the apples so uniformly graded as last year. This applies more particularly to those from Tasmania, and in my opinion this is attributable to the fact that in their anxiety to get full freight shippers sent apples that were not of sufficiently good quality for export purposes.

The fruit generally was well carried, at temperatures varying in different ships, from 35 to 42 degrees Fahr., but while I would not like to draw invidious distinctions, I must say it was carried better and more carefully handled by some lines than others. The packing is open to great improvement, as those on the top of the box when opened show the effect of undue pressure, and present a bruised appearance. Australian pears generally arrived in much better condition than those from Tasmania; a number of the latter were condemned. The few grapes that were sent were fairly good. Cork-dust is the best packing for these. The passion-fruit was not a success.

There is room for considerable expansion in the apple trade, but to make it entirely successful none but the best selected fruit should be sent. It should be very carefully graded and packed, and a popular price on the market

here would be 7s. per box of 40 lb. The favourite and best selling kinds of Australian apples for this market are (1) Dunn's Seedling, (2) Jonathan, (3) Cleopatra, (4) Rome Beauty, (5) Munro Favourite. Apples realise the best prices from the first delivery till the middle of May, after which except for small specially selected choice marks, they do not as a rule fetch remunerative prices, as they come in competition with European summer fruits, strawberries, &c.

25th June, 1908. (Signed) A. J. BRISLEY.

Apples.

Prices current at Covent Garden for the week ending 23rd April.

			s.	d.		s.	d.
Australian—	Pearmain ...	40 lb. box	11	0	to	13	0
	Cleopatra ...		13	0	,,	15	0
	Cox's Orange ...		15	0	,,	17	6
	Jonathan ...		13	0	,,	15	0
	Wellington ...		12	6	,,	16	0
Tasmanian—	N.Y. Pippin ...		12	6	,,	14	6
	Alexander ...		11	0	,,	13	0
	Reinette ...		10	6	,,	12	6

Prices current for the week ending 14th May.

			s.	d.		s.	d.
Australian—	Pearmain ...	40 lb. box	9	0	to	10	6
	Cleopatra ...		9	0	,,	11	0
	Cox's Orange ...		11	0	,,	14	0
	Jonathan ...		9	0	,,	11	0
	Wellington ...		10	6	,,	11	6
Tasmanian—	N.Y. Pippin ...		9	0	,,	11	0
	Alexander ...		8	0	,,	9	0
	Reinette ...		8	6	,,	9	6

Prices current for the week ending 25th June.

			s.	d.		s.	d.
Australian—	Pearmain ...	40 lb. box	8	0	to	9	0
	Cleopatra ...		8	6	,,	10	6
	Jonathan ...		8	0	,,	9	6
	Dunn's Seedling ...		8	6	,,	9	6
Tasmanian—	N.Y. Pippin ...		10	6	,,	14	0
	Nonpareil ...		7	6	,,	9	0
	Reinette ...		7	0	,,	8	0
	Stone Pippin ...		7	6	,,	8	6

Progress Report from Mr. W. W. Froggatt.

[Mr. Froggatt was travelling on behalf of the Governments of Queensland, New South Wales, Victoria, and South Australia, in quest of means of combating the fruit-fly and codling moth pests, and other fruit and plant diseases. He has now returned to Sydney, and his complete report will be published in a Special Bulletin as soon as possible.]

R.M.S. "China," Red Sea,
23 May, 1908.

Sir,

I have the honour to furnish you with a brief summary of my investigations since I posted my last at Constantinople.

I left that town on the evening of the 30th of April, bound to Cyprus, *via* Smyrna and Beyrout, reaching the former town on the following day, when I went ashore and went through the markets, where everything under the sun can be purchased—from old weapons to fruit and vegetables. All the latter were of the same kind and quality as those in the Stambul markets, to which Smyrna sends a large amount of produce.

At Beyrout the cultivation of the mulberry is the chief industry, and the whole valley of the Dog River, and for some miles beyond the town, is nothing but mulberry plantations, while there were scores of silk-reeling machines and primitive hand-looms for weaving in the houses I passed through.

A large quantity of fruit and vegetables is grown in the neighbourhood, and the whole valley was dotted with wells and pumps for irrigating the land.

Large quantities of loquats were exposed for sale in the markets (some of rather fine quality), and all the trees in the gardens of the town were covered with nets to protect them from the birds. Green cherry plums were also sold in large baskets. Very small cucumbers and immature young squashes, with quantities of slender French beans, were the chief vegetables. The large, oblong Jaffa oranges were plentiful, with several small and poor varieties.

Early on the morning of the 8th May we anchored off Larnica, and I joined forces with Mr. Clement Reid, of the British Geological Survey, who was visiting the Island of Cyprus to report upon its water supply, and travelled to Nicosia in his carriage, a distance of 26 miles, over a most barren strip of white, chalky mud and limestone hills and valleys. Wherever there was a bit of land it was planted with barley; but until we came within a mile of the capital there was absolutely no shade or trees except a few Australian Wattles planted round the rest-houses and police stations.

As soon as we arrived I presented my credentials to the Director of Agriculture (Mr. Saracomenos), and made an appointment to go out next morning and see the methods they adopted for catching the young locusts. The same afternoon we attended a reception at the High Commissioner's, and left our cards. Next day I had an interview with Sir Charles King-Harman at Government House, and obtained his authority to get Mr. Bevan, Assistant Director of Agriculture, to go round the agricultural centres of the island with me. With Mr. Saracomenos I drove out to the low, scrubby hills where the locust-catchers were at work sweeping the ground with large calico nets, shaped in front like a bow, so that the flat side was drawn over the surface of the ground, and the young hoppers fell into a small bag-like appendage at the bottom of the net, from which they were shaken into a small bag that the hunter carried tucked into his belt. We then went down to the Government Camp, and saw the method of buying them by weight from the hunters, who receive a slip giving the amount due to them, which they present at the Treasury for payment. The accumulated catch is shaken into a large sack, which is finally emptied into a pit of quicklime and covered up. Since the time of the British occupation of Cyprus, in 1879, active operations have been carried on against the locusts that breed in the rough, barren lands of the island, and which had, under Turkish rule, often devoured the greater part of the crops grown on the island.

At first attention was turned to the collection and destruction of the eggs, and a tax of 7 to 8 okes of eggs (1 oke equals $2\frac{4}{5}$ lb.) had to be paid to the Government by every able-bodied man on the island. This collection started on the 1st of June, and by the end of the year 138,422 okes of eggs had been brought in and buried. Each pod of eggs was found to contain 30 to 35 eggs, and each oke contained from 450 to 500 pods, so that the quantity of eggs destroyed made a total of 2,000,000,000. In spite of this work being carried out, on the following year the locusts did not appear to decrease, and the natives lost heart. In 1881 it was decided to use Mr. Richard Muttei's methods of pits and screens, and until 1897 this was the plan adopted, an income-tax being made law, the revenue of which was used for the expense of killing out the locusts.

Screens were erected, and pits dug along the line of march of the locusts as soon as they emerged from the eggs and began to feed, and they were driven against the screens, from which they fell, and, moving downwards, encountered the pits, into which they tumbled, men with spades covering them over with earth and tramping them down when full.

In 1883 the Government employed 2,631 men on the work of locust destruction, and 7,543 screens were in use, most of which were in 50-yard lengths. In the following year 11,085 screens were in use, when the sum of money expended in this work reached to £14,746, and between the years 1881 and 1886 the sum of £66,841 was spent on this work.

The Commissioner, commenting on this expenditure in his report, says:—"Large as this expenditure may seem, it is certain that it has already been recovered by the island many times over in the value of the crops saved.

Assuming that only one-quarter of the wheat and cotton, and one-eighth of the barley and oats, would have been destroyed had no vigorous measures been taken to destroy the locusts, the loss to the island would have amounted to £80,000. These figures are derived from the estimated value of the crops, based on the assessment of the tithes of the years 1882–83–84."

From this date the Government had the locust plague well in hand, and the operations were reduced, and the expenditure fell to £3,598 in 1894, though it rose again to £7,000 in 1896. At the present time the only methods adopted are the catching of the young hoppers with nets, as previously described, and the amount expended has dwindled down, so that the income-tax has been relaxed.

I am informed on very good authority, however, that it must be also taken into consideration that since the British occupation a very large area of land, in which the locusts laid their eggs, has been broken up for cultivation, so that they have been driven into the barren lands, where they can be much more easily dealt with than in the first years of the crusade against them.

On Sunday (10/5/08), accompanied by Mr. Bevan, I left Nicosia and travelled across the island to the town of Limasol, the centre and port for the wine and carob bean industry.

This was a distance of 55 miles, with four horses and a coach; the road was over rolling low chalk and marl lands for the first 10 miles, and then we were well into the carob and olive tree country. The carob tree grows on very poor soil beyond the area of irrigation, and is apparently as hardy and as long-lived as the olive tree; the trees are all grafted, and the beans are picked about the end of June—the date upon which the picking is to commence being fixed by the High Commissioner, on account of the fact that the ownership of the trees is so complicated, as many of the trees belong to persons who do not own the ground on which they grow, and if they were allowed to gather the harvest any time, there would be some trouble. In 1906 there were 44,965 tons of carob beans exported from Cyprus, valued at £157,452; most of these are ground up and made into cattle foods, at least half of the crop going to England.

There is a wild species of this tree growing upon the island, but the pods are of no value; it is distinguished from the cultivated form by the natives with a Greek name, meaning "Sent by God," otherwise, self-grown.

I believe that at one time our Department proposed to plant the Carob or Locust Tree in the dry parts of Australia, and, as a tree capable of growing such immense crops of edible beans in our stock country, I think the experiment could be revived; young plants or seeds could be easily obtained in any quantity from the Forestry Department of Cyprus. The olive trees in some parts of Cyprus are very old, so old that in many places the central portion of the tree has rotted out, and each angle has grown round, forming a bunch of three or four trees. These are said to be in many instances four or five hundred years old; yet when we passed through them they were one mass of bloom, and as vigorous looking as the younger trees. However, as most of the land suitable for olives will grow vines, they do not grow enough olives for their own consumption, and import some olive oil.

We arrived at Limasol late that evening, and called upon the District Commissioners, who had arranged to send us mules to Plateris to take us over the mountains. On Monday morning we started up through the foot-hills covered with vines—for the natives plant their vineyards up to the very top of the mountains, on slopes so steep that it is wonderful how they can gather them. All day long we met caravans of muleteers, with their animals carrying a pig-skin of wine on either side of the pack-saddle. As they treat most of their wine with gypsum, and often paint the pig-skins on which they carry it to market with a coat of tar, some of the native-made wine has a somewhat strong flavour; but there is an English company which has taken up the wine-making industry, and the export of an improved quality has resulted. In 1906 there was an export of 36,281 gallons of Commandaria, worth £1,993, and 878,059 gallons of other kinds of wines, worth £20,487. The greater part of this wine goes to Egypt, though the English company make shipments to England and Germany. We stopped at the village of Perapidha, when next morning some of the Greek villagers brought me specimens of a small moth grub that was eating off the buds of the vines.

Oidium is very bad on these high lands, and the Government import large quantities of sulphur and distribute it at a very low rate, or free, to the vine-growers, but they are only just beginning to take the matter up. Later on I found a very curious leaf gall upon the vines which at first sight appeared exactly like leaf galls of Phylloxera, but on closer examination appear to be caused by a leaf mite.

Cyprus is one of the few vine-growing places in the world where Phylloxera has not been discovered, and, since the British occupation, no plants of any kind can be imported from countries where that disease is known to exist.

On Tuesday night we camped in the Summer Government House on the top of Mount Troodes (6,000 feet above sea level), occupied by the Commissioner and his staff later on in the season. Next morning, by winding side tracks, rounded Mount Olympus, still covered with snow, and turned down the great Athalassa valley. The first village we stopped at, Prodromus, is the highest up the mountains on the island, and confines its attention to growing apples. Here, as everywhere else, we found the trees covered with the nests of a small "web worm," a lepidopterous larva that does a great deal of damage. There is another one in the pine forests that often strips the young pine trees of their needles and covers them with masses of its nests.

There was also a large borer in the branches of the apple trees, but the owner said they were only found on the hillsides. At mid-day we came into the village of Pedoulous, with very rich black soil, also perched on the mountain side, devoted to cherry and mulberry trees, but, as in the upper village, though they were all irrigated from the river coming down the valley, there was no attempt to prune or cut out any dead wood, and many of the cherry trees were an immense size.

From here downwards we passed through many small villages built along the cliffs, with our path sometimes winding over the flat earthen roofs of the lower houses.

At dark we had reached the bottom of the valley, and at 8 o'clock entered the Turkish town of Lefka, where all the oranges on this side of the island are grown, and here we stopped at the Police Station, as there was no hotel or rest-house in the town. Next morning, under the guidance of a zaptich (Turkish policeman) we went through a number of the orchards, which in most cases were regular thickets, as young trees had been planted, or seedlings had grown up all through the place among the older trees. The oranges had been nearly all gathered, but still there were some on the trees, and a great number on the ground. Those upon the ground had been all cleaned of their contents by the rats, and were simply skins. I could find no signs of fruit-flies, nor could I find out from the owners if they ever suffered from the pest; but Red Scale was very common, and did a good deal of damage all through the orchards, and is just as plentiful in all the gardens about Nicosia.

From here we rode to the railway terminus at Morphou, and returned to Nicosia that afternoon, after a very interesting trip across the island. The Forestry Department in Cyprus is a very important institution, and there is a great deal of the island that is treeless, while the high mountains are covered with fine forests of pines. Mr. A. K. Bovill, who has charge of this work, has planted a great number of different species of Australian trees, chiefly Eucalyptus and Acacia, and at Athalassa has a large area of barren marl and chalk hills covered with thickets of young wattles, which are growing well in very poor dry soil. He is extending this every year, and hopes before long to supply the towns with firewood, of which at present, round all the towns, they have none, importing charcoal and using a small prickly shrub (*Poterium Spinosum*) that covers the low hills, to do all their cooking and baking.

In the island there are about a quarter of a million goats, and as there is not a fence on the island, these are shepherded through the forests and open lands, and supply food, milk, cheese, butter, skins for boots, and hair for ropes, bags, &c.; as soon as the foresters enclose areas for planting, the villagers cry out they are being robbed of their free range; and the department says that the goat, from the amount of trees it destroys, is their greatest enemy, but it is a vested interest that has to be considered in all forest work.

There are about the same number of sheep in the country, usually shepherded with the goats. They belong to the fat-tailed variety, the tip of their tail being twisted like a corkscrew, and the greater number of them are black or piebald. Their wool is almost hair, and the best worth only about 6d. a lb. The Department of Agriculture is trying to improve the flocks, but find it very slow work.

The following morning I left Nicosia at 6·30 a.m. for Famagusta, and reached there at 10 a.m., when I called upon the District Commissioner (Mr. Travers), who very kindly placed one of his staff and a coach at my disposal to inspect the orange orchards of this district, about 3 miles outside the town.

The soil of this orchard district is very fine sandy loam, all under irrigation, with water that is drawn up from wells about 20 to 30 feet in depth with the old wheel and earthenware jars, worked by a mule. The trees are planted

in deep basins about 9 feet between each tree, and the water is distributed from the main channels. For about five months they do not need to use water, but later on once a week, and when the crop is on the trees, twice a week. They could not understand how we could grow oranges anywhere without regularly watering the trees, as they have little or no rain for six months when the crop is ripening.

All the trees are budded in a very primitive manner, but all the best oranges and pomegranates are grown in this district. They are quite as large and well flavoured as any of the Jaffa oranges that come into the market at Constantinople, and besides the long oval form there is a large hemispherical one just as fine. The Commissioner told me that it was the oranges from this place that took the first prize in London at the show.

Though Mr. Saracomenos told me that fruit-fly was a common pest in these orchards, the growers did not seem to think much about it. The "disease," as they call it, that did an immense amount of damage to their trees, and is still very bad, is our common Red Scale (*Aspidiotus auranti*). This scale is very common all over the Cyprus gardens, attacking roses, and I even found it on wattles. They are now painting the tree trunks with lime wash, and do a little spraying after seeing the results of experiments by the Department of Agriculture; but, as one orchardist said, "The Good God sent it, He will take it away," and this is the attitude of both Greek and Turk in the East.

In 1906 there were 8,431,217 oranges exported from Cyprus, chiefly to Egypt, valued at £6,056; while in the same year 42,374 cwt. of pomegranates, valued at £8,107, were exported.

A good many mulberries are grown in some districts, and the Department has encouraged the growing of silkworms by seeing that all the seed (eggs) imported is pure; most of this is sold in the cocoon, but a certain amount is made into native silk with hand-looms in Nicosia.

I left Cyprus for Port Said at midnight on the 15th, and reached there early on Sunday morning, 17th, catching the train up to Cairo at 8 a.m., and reaching the latter place at 2 o'clock.

I went round first thing the next morning to the offices of the Khedivial Agricultural Society, where I met Mr. F. C. Willcocks, Entomologist to the Society, Mr. Balls, Botanist, and Mr. Hughes, Chemist. This is a private society, but is supplemented with a sum of money from the Government to pay the salaries of the officers, who have well-fitted laboratories and an experiment garden, where experiments on breeding cotton are carried on in conjunction with other crops. I went through their collection, and also over their plots, when we called upon Mr. Brown, in charge of the Gardens of the School of Agriculture, a separate institution, the Director of which (Dr. Fletcher) I met on the following day.

The worst enemy of the cotton all over Egypt is the Bollworm (*Earias insulana*), which lays its eggs upon the surface of the small boll, and the young caterpillars burrow and damage it, so that it falls off and never reaches maturity, much after the same fashion that the larvæ of the American boll weevil does in the United States.

The moth is a very handsome little green creature, and the species found upon cotton growing at the Hawkesbury College, and also at Moree, and described in the *Agricultural Gazette* as *Earias fabia* (1903), is identical with this variable and widely distributed species.

The fruit industry is very poorly represented in Cairo; most of the best oranges are imported, and it is very curious that while there is some Red Scale upon the orange trees here, the common and by far the worst scale of the citrus trees in Egypt is the Round Scale (*Aspidiotus fici*), the fruit often being thickly encrusted with the scale. There are quite a number of apricot gardens around Cairo, but the trees are let run wild, apparently all seedlings, and though they are irrigated, they are very small, and are gathered by shaking the trees and gathering them out of the dust. In the market there was a great quantity of fine vegetables of all kinds, and on several stalls I saw bundles of vine leaves for sale; the seller told me that the Arabs slice them up and eat them with rice.

I visited the Survey Department, where I saw all the plans of the Nile Delta lands, with their thousands of little plots of freehold land, often only three yards wide and a couple of hundreds yards long—yet it keeps a family.

At the Veterinary Department I met Mr. Littlewood, who gave me some notes on the many diseases that attack the stock, and said they had not the least idea of the number of sheep or horses in Egypt, but roughly there were 718,000 cattle and 781,000 buffaloes on the returns for 1907; great numbers of stock of all kinds were imported every year for food, while 44,000 camels were also imported from Asia for food last year.

In going through the Entomological collection, while Mr. Willcocks had no specimens of the fruit-fly, *Dacus longistylus*, that has been several times recorded from Cairo, I found he had a number of specimens of our Mediterranean fruit-fly (*Halterophora capitata*), which, as far as I know, has never been recorded from Egypt. These were bred from Egyptian oranges.

As I was informed that the conditions of cultivation all over Egypt were the same, and I would have had to remain six days longer in Cairo if I missed the next mail boat, I took my passage in the R.M.S. "China," and reached Port Said late on Tuesday night (19th), transhipped at Aden into the R.M.S. "Oriental" on the 24th, and expect to reach Bombay on the 29th. I expect to be there two or three weeks, come down to Ceylon, and, after a week at the Entomological Station, leave for Australia.

I have, &c.,

WALTER W. FROGGATT.

To the Minister of Agriculture, New South Wales.

Sir, R.M.S. "Omrah."

I have the honour to report that since my last letter I have been over a considerable portion of the Agricultural districts of India and Ceylon, and am expecting to reach Fremantle in two days, where I leave this boat, to visit the West Australian Department of Agriculture, and come on to

Adelaide a few days later. I was requested in my instructions from the Queensland Government to visit West Australia, and the Hon. T. Price (Premier of South Australia), who is on this boat, agrees that I should step off before coming on. As soon as I leave Fremantle, I shall lose no time in coming on to Sydney, but shall call on the Departments of Agriculture of South Australia and Victoria on my way home, and come overland.

I reached Bombay on the 29th May, 1908, and at once called upon the Colonial Secretary, who gave me letters to the Acting Director of Agriculture at Poonah, to which place I went the following day, and, after getting some information from him, drove down to where the new Agricultural College is being erected, and met Dr. H. H. Mann, who, after being scientific adviser to the tea-planters of Assam, has been appointed the Principal. I returned the following night to Bombay, and an hour later took the night mail to Calcutta, to Waine Station, the nearest point to the Imperial Research Laboratories at Pusa, Bengal. On the road I received a telegram from Mr. Howlett (second Imperial Entomologist), saying he would meet me at Allahabad, where he was investigating fruit-flies. I met him at the junction at midnight, and we spent the next three days around Allahabad, Cawnpore, and Lucknow, in orchards and melon fields. Then we parted company, while I went north to Dehra Dun and Missorie to see Mr. Stebbing, the Entomologist of the Indian Forestry Department; but though I met other officers of the department, Mr. Stebbing was away on tour. I then returned, travelled all Sunday night, and met Mr. Howlett at Mogul Seria on Monday evening, and reached Pusa at 6 o'clock on the Tuesday morning.

Here I spent five days working in the laboratories with Messrs. Lefroy and Howlett, and collecting and breeding fruit-flies in the peach orchard, among the mango trees, and in the melon fields. On the 16th June, 1908, accompanied by Mr. Howlett, who has been specially sent out to Pusa to study the habits of biting flies and *diptera* generally, I left for Calcutta, which we reached on the following day, and spent the afternoon going through the collections with the curator, Dr. Annandale. Leaving late the same evening for Bangalore *via* Madras, which we reached early on the morning of the 20th, the Director of Agriculture at Madras sent the Entomological Assistant on his staff with us, and Mr. Ayer proved a very useful guide and interpreter to us while in the State of Mysore, where we collected a great number of fruit-flies in all kinds of fruits. Though the season was practically over we obtained maggots on nearly all the fruit.

Though in the course of their investigations on Northern India, after breeding out some thousands of fruit-flies, only three specimens of a parasite have been bred in Bangalore, Mr. Ayer finds at least three small braconid wasp parasites in the fruit-fly pupæ that infest the guavas that ripen in October and November, but at the same time he estimates them as reaching only 12 per cent. of the flies, and has never obtained any parasites from pupæ taken from mangoes, oranges, or peaches.

All the nurserymen agreed that all their guavas have been destroyed for the last six years with fly maggot. I therefore hold out very little hope of

this being an effective parasite in Australian orchards, if it cannot check the ravages of the fruit-fly in its native haunts; but if any of the Departments of Agriculture interested want to obtain those parasites, a number could be obtained at a very small cost.

I have enlisted the services of the Imperial Entomologist and his assistants to take up the matter, and the Director of Agriculture for Madras will lend his native assistants, who are trained entomologists, and if so instructed would collect and forward *via* Colombo parasites and pupæ this coming season.

Returning to Madras on the 25th June, 1908, I parted with Mr. Howlett, who has given me such valuable assistance, and started for Ceylon *via* Tuticorin the same evening, reaching the boat the following evening and landing in Colombo early next morning (Saturday, 27th).

After calling at the Agricultural Society's offices and the Chemical Branch of the Botanical Gardens Station, I left for Paradenyia the same afternoon, and spent the two following days at the laboratories of the Royal Botanic Gardens examining the collections and collecting fruit-flies. Then, with Mr. West (Acting Entomologist), I went across to the south-east of the island, among the tea plantations, where I found that fruit-flies were common in the garden fruits later in the season. Returning the next day, I met the Director of the Royal Botanic Gardens, who advised me to visit the great mango district of Jaffna, in the north of Ceylon, and he wired to the Resident of the district to place his officers at my disposal while there.

Reaching Jaffna late the following night, I was met by Messrs. Mattahumura and Chelones, who arranged everything for me until I left. In the morning we drove through 20 miles of palm groves and cultivated lands, and though the season was late and there was not much fruit about, I found any amount of fruit-fly maggots in the melon fields, from which I have since bred a fine series of a large fruit-fly, allied to *Dacus curcubitæ*. On my return to Colombo I spent the morning with Dr. Wiley at the museum, and examined his collections.

The Mediterranean fruit-fly is not found in India or Ceylon, though I found specimens in the collections at Cairo. All the fruit-flies in the latter countries belong to the genus *Dacus*, and are allied to the Queensland fruit-fly.

The parasites in Bangalore are only bred from species of *Dacus*, and we have no record of one on the Mediterranean fruit-fly.

I have, &c.,

WALTER W. FROGGATT.

To the Minister of Agriculture, New South Wales.

METEOROLOGICAL BUREAU, NO. 4 DIVISION, NEW SOUTH WALES.

Weather Conditions during July, 1908

S. WILSON,
Divisional Officer.

THE month opened with an extensive antarctic low pressure covering the southern districts of the continent between Perth (W.A.) and Clarence Heads, on the coast of New South Wales. Cloudy and unsettled conditions ruled throughout this area, with strong south-west gales and rough to high seas between the Leeuwin and Breaksea. Hail was also experienced in the south-west corner of West Australia. In New South Wales light rain occurred in the south-east quadrant.

A rather energetic anticyclone appeared over the western half of the continent on the 2nd, with its centre in the southern gold-fields. As the result of its presence there, finer conditions obtained, but, on the other hand, further unsettled, showery weather occurred over the southern seaboard districts of the continent. Many frosts occurred in the north-east quadrant of New South Wales.

Within the next twenty-four hours the high pressure had spread over the whole continent, its advance eastward being attended by much finer weather and a contraction of the rain area to the coasts of New South Wales and Victoria. In our State light to heavy rainfalls were recorded between Sydney and Bateman's Bay, and light in northern parts of Riverina and south-western slopes.

At 9 a.m. on the 3rd an anticyclone of considerable dimensions covered Australia, with its highest barometric values over Central and South Australia. A rather energetic depression was also shown in the Tasman Sea, and slight evidence of another in the extreme south-west of the continent.

As the result of this distribution of atmospheric pressure, fine, cold weather for the most part ruled over inland districts, but cloud areas and showers along the coastal and southern areas. By the 5th the high pressure had advanced eastward, and covered only the eastern States, whilst an antarctic disturbance had spread northwards and eastwards from the Leeuwin until it occupied the south-western quarter of the continent, causing in West Australia heavy rain throughout, with thirty-one stations registering over 100 points, and thirteen over 200 points. In South Australia light rain was recorded at scattered places, chiefly coastal in Victoria, light to heavy rain in South Gippsland, and scattered elsewhere, light falls in the south-eastern districts of Queensland and in New South Wales, light to moderate amounts at two or three places on the central coast and south-western slopes.

Within the next forty-eight hours the centre of the low pressure had travelled 600 miles eastward to Eucla, on the Great Australian Bight. The "high" over Eastern Australia had also worked eastward, and at 9 a.m. on the 7th covered only half its former area, and presented a rather compressed formation. Strong south-westerly winds, which blew in fierce squalls, and rough seas occurred along the south coast of West Australia.

The heaviest rainfall was reported from Albany, with 124 points, and Breaksea 103 points. Many frosts were experienced in the north-east quadrant of New South Wales.

At 9 a.m. on the 8th, the "high" was still located over the eastern districts of the continent, but the low pressure had contracted considerably, so that it now covered the area contained within lines joining Eucla (on the Great Bight), Boulia (in Queensland), and Melbourne. With this distribution general rain was recorded in South Australia; otherwise over the southern States the falls were light and scattered.

During the following 24 hours, a closed-curve depression developed over Victoria and western districts of New South Wales, and resulted in light and scattered rain generally in our State, except in the far west and along the southern border, and heavy, with thunder and hail, in the metropolitan area. The largest amounts were 240 points at Marrickville, 215 at Mosman, 170 at Ashfield, 161 at Riverview, 130 at Strathfield, 126 at Carlton, 105 at Hunter's Hill, 103 at Bankstown, 51 at Parramatta, and 40 at Wahroonga.

Temperatures over the State during the first week were for the most part mild. Indeed the registrations during the latter part reached into the seventies over western areas. The highest records were—Mungindi, Mogil, and Moree, each 75 degrees; Walgett 74, Bourke 73, and Narrabri 72 degrees. The lowest temperature in the State occurred on the 4th, when Kiandra reported 2 degrees below zero, or 34 degrees of frost.

At 9 a.m. on the 10th anticyclonic or fine weather conditions ruled for the most part, but an antarctic disturbance was shown over Tasmania and the southern shores of the continent, which resulted in fresh to strong north-west to south-west winds, and slight to high seas in Bass Straits, and on the west coast of Tasmania. Light and more or less isolated rainfall was also recorded in the several States. By the next 48 hours the disturbance had passed seaward and the weather of Australia had come wholly under the influence of the anticyclone, consequently fine and cold conditions prevailed. The high pressure system controlled the weather of the greater part of the continent until the 16th. Its isobars, which showed a series of depressions or dips over Eastern Australia, were so arranged as to influence moisture-laden winds from the ocean to inland districts, where some good rainfall, associated with thunder, resulted. The heaviest falls reported at 9 a.m. on the 16th were:—Hungerford 164 points, Cobar 156, Wanaaring 132, Byrock 135, Louth 115, Girilambone 100, Barringun 95, Dandaloo 90, Tilpa 88, Bourke 77, and Nymagee 75 points.

During the week ended the 23rd, two anticyclones and one antarctic disturbance passed over Australia. The anticyclones were immense pressure systems. Approaching the continent at about Geraldton, on the coast of West Australia, they gradually extended their influence eastward until all the mainland and the Tasman Sea between New Zealand and the coast of New South Wales and covered by their isobars. Where these latter controlled winds, from the surrounding ocean to the seaboard showery tendencies obtained, but for the most part fine weather ruled over the interior districts of the continent. Conditions were cold and frosty, generally over the southern parts of Australia during the week, excepting from the 17th to 19th, when, owing to the peculiar distribution of atmospheric pressure over the eastern States, and the resultant winds, some high temperatures for July occurred over various districts.

The highest temperatures recorded in each of the subdivisions were: Western Division, 78 degrees at Mungindi; North-western Plains, 79 degrees at Pilliga; Central-western Plains, 74 degrees at Carinda, Quambone, and Coonamble; Riverina, 68 degrees at Cudgellico; North-western Slope, 75 degrees at Narrabri; Central-western Slope, 67 degrees at Coonabarabran and Wellington; South-western Slope, 67 degrees at Grenfell; Northern Tablelands, 74 degrees at Tabulam; Central Tableland, 67 degrees at Cowra; Southern Tableland, 63 degrees at Braidwood: North Coast, 80 degrees at Grafton and Kempsey; Hunter and Manning, 79 degrees at Manning Heads; Metropolitan, 78 degrees at Parramatta; South Coast, 80 degrees at Bodalla.

Between the 18th and the 21st strong northerly winds, with rough to high seas, and some good rainfall associated with hail, resulted from the antarctic disturbance, more especially over the southern parts of the continent. In West Australia, Perth had 152 points, Katanning 84, and Geraldton 76; on the Queensland coast, Townsville had 130 and Cairns 124 points; in New South Wales light to heavy falls were recorded in the south-eastern quadrant and on the extreme North Coast. Kiandra had 142 points, Young 117, Adelong 98, Tumut 96, Tarcutta 93, and Burrowa 78 points.

During the last week of the month, an energetic and extensive anticyclone controlled, for the most part, the weather of Australia. This high pressure system, which is remarkable for its longevity, first appeared in West Australia on the 20th, and thence rapidly extended eastward until it covered the whole continent on the 22nd. Since this latter date the isobars were so arranged (horizontally) as to govern fresh to strong south west to south-east winds along the seaboard and east and north-east inland. Not only was this pressure distribution favourable to the transportation inland of winds laden with moisture, but the many depressions around the isobars of the anticyclone were responsible also for the accumulation of moisture over many parts of New South Wales and the other States.

One series of these depressions in the isobars was shown on our central coastal districts, and assisted in the remarkable rainstorm between July 27th, and August 10th inclusive, during which so many heavy falls were experienced in the metropolitan area and its outskirts. The winds on the coast,

too, were very strong in parts, fresh to strong gales being recorded at various places, and a whole gale at Jervis Bay. Rough seas were also experienced on the seaboard. From the 24th, rainfall occurred over many parts of Australia. On the 26th, Cossack reported 222 points, and Nullagine 102 points, being the largest amounts experienced in Western Australia, and some good falls in the aggregate were recorded in Central Australia Alice Springs had 353 points, and Charlotte Waters 191 points. Light to moderate falls were also recorded in the other states.

On the 30th, whilst the showery conditions on the coast were yet prevailing, a monsoonal development was in progress in Central Australia; in fact, extending from the Gulf of Carpentaria to the Great Australian Bight, causing further unsettled, showery weather.

Rainfall during JULY, in New South Wales.

Speaking generally, the rainfall for the month has been below the average over fully two-thirds of the State. The greatest disparities were experienced on the north-east quadrant, and over the greater part of the slopes and plains, ranging from 120 to 356 points below the average on the north coast, from 68 to 170 on the northern tablelands, and from 24 to 170 points on the plains and slopes.

On the other hand, the north-west quadrant of the State has experienced totals which are much in excess of the average amount, and which, perhaps, represents the best winter falls in those parts for some considerable time. Some very good falls were also experienced on the coast between Port Macquarie and Jervis Bay, where, as the result of the persistent rainstorm from the 27th to the 31st, inclusive, the totals were considerably larger than the average. The heaviest falls for the month in the latter area were : 1,204 points at Mosman, 1,159 at Sydney, 1,151 at Port Stephens, 1,121 at Seal Rocks, 1,070 at Newcastle, 1,002 at Glebe Point, and other amounts ranging from 981 at Cape Hawke to 195 at Wollongong.

The distribution of rainfall over the various subdivisions of the State during July, was as follows:—

		Departure from normal. Points.		
		Above.		Below.
North Coast	from	—		120 to 356
Hunter and Manning	,,	468	to	116
Metropolitan	,,	698	to	7
South Coast	,,	134	to	332
Northern Tableland	,,	- -		68 to 170
Central Tableland	,,	4	to	150
Southern Tableland	,,	28	to	257
North-western Slope	,,	—		24 to 170
Central-western Slope	,,	—		58 to 170
South-western Slope	,,	113	to	99
North-western Plain	,,	—		65 to 117
Central-western Plain	,,	123	to	73
Riverina	,,	20	to	79
Western Division	,,	205	to	68

CLIMATOLOGICAL table for the month of July, 1908, compiled from daily telegraphed returns.

Station.	Mean Barometer at 9 a.m.*	Mean Maximum.	Mean Minimum.	Absolute Maximum.	Date.	Absolute Minimum.	Date.	No. of days below 40 deg.	Rainfall, Inches.
	TEMPERATURE.								
		°	°	°		°			
Walgett	30·26	63·8	36·5	78	21	26	2	18	0·33
Bourke	30·22	60·4	37·9	76	21	27	6	17	1·81
Wilcannia	30·20	60·7	37·7	72	9 & 21	29	23 & 24	18	1·51
Wentworth	..	59·1	38·0	66	20	28	24 & 25	15	0·48
Hay	30·24	58·2	35·6	65	9	27	23	20	0·98
Deniliquin	30·24	54·2	39·3	62	20	33	13 & 27	15	0·51
Albury	30·18	54·2	36·9	64	20	30	3	20	1·81
Forbes	30·23	53·0	37·7	62	21	29	4, 23 & 24	16	1·54
Dubbo	30·24	60·0	34·1	71	20	25	4 & 24	19	0·78
Clarence Heads	30·18	64·1	48·0	74	22	40	2	0	1·90
Port Macquarie	30·21	62·9	42·6	74	21	33	1	9	5·22
Newcastle	30·18	60·7	46·9	74	21	36	25	2	10·70
Sydney	30·20	58·2	44·4	73	20	37·8	2	5	11·591
Jervis Bay	30·16	56·3	46·7	69	20	34	6	1	6·69
Eden	30·18	52·7	41·6	66	14	36	4	9	0·85

* Corrected to 32 deg. F. and M.S L.

COMPARISON WITH INDIA.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia as far as data are available, for the month of July, 1908:—

	Departure from normal. Pressure.	Temperature.	General Conditions (referring to State as a whole).
	inches.	degrees.	
Simla (India) ...	+ ·01	- 0 3	Rainfall in excess.
Adelaide (S.A.) ...	+ ·06	- 1·7	Above average in Central Australia and parts of S.E. Coast, elsewhere considerably below.
Perth (W.A.) ...	+ ·03	- 0·3	Excess in W. Kimberley, N.W. division and S.W., elsewhere below.
Melbourne (Victoria)	+ ·06	- 1·3	Rainfall above average in S.W., considerably below elsewhere.
Sydney (N.S.W.) ...	+ 0·8	- 1·0	Considerably above average over N.W quadrant, Central Slopes, and Tableland, also coast between Port Macquarie and Jervis Bay, elsewhere below normal.

Judging from the above table, atmospheric pressure has been above and temperature below normal in both India and Australia. Whilst rainfall generally in India has been in excess, the amounts over Australia during the month were not so regular, some parts of the various States being above and others below normal.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

Green Manure.—If the crop has not been turned under, it should be, as early as possible. If the disc cultivator is run over the growth before ploughing it will not be found difficult to turn it under. The ground should be harrowed immediately it is ploughed, in order to pulverise all the soil and prevent it from baking and setting hard.

Loosening Soil around Trees and Vines.—All soil should be loosened with either a fork-hoe or a spading fork, and all couch grass, sorrel, or other weeds removed and burnt. This work should be carried out in the early spring while the soil is moist and easy to work.

Ribston Pippin Apple.

Grown by Mr. Herbert C. Suttor, Brucedale, near Bathurst; planted 1884.

Budding Walnuts.—A subscriber to the "Pacific Rural Press," of California, describes his method of budding the walnut, as follows: "Using Franquette buds and the ring method of budding. The stock was California Black Walnut, and I cut out a piece of bark ½ to 1½ inches wide, and inserted my ring-buds taken from the Franquette tree. These were cut to fit as nearly as possible, but if they were not large enough to go around,

another piece of bark or a bud was cut out and fitted in the space. The buds were then securely fastened with strips of calico or even strips of flour sack; it is immaterial which is used, so long as it is tightly tied. The buds were put in in the early fall and cut off in the early spring, and by the ensuing fall the young buds had grown to a height of 9 feet. Buds may be inserted in limbs of a tree in this manner, or into the stock, as required.

Plums.—One of Burbank's latest plums is named the "Formosa," and he claims that it is one of the best he has raised: a regular bearer, strong, hard, wiry wood, and the fruit is unequalled in quality, with, perhaps, the exception of the "Santa Rosa," which was first put on the market last season. It blossoms with the "Burbank" and "Abundance," which are two of the latest bloomers, and in consequence usually escapes the late frosts. Flesh: pale yellow, and when ripe the fruit turns a rich red. A good keeping and carrying plum.

Fruit Fly.—There is a very marked decrease in this pest this year, but growers must not relax their vigilance on this account, but must continue to fight it. In addition to picking up and boiling all fallen fruit, it would be well to set kerosene traps in November in our warmer districts. In fact, as soon as the fly is found it would be well to set the kerosene traps immediately.

Spraying.—A good many growers are using the lime and sulphur spray this year, omitting the salt, and those who have done so claim that it is not so severe on the hands, and in every respect is a much easier spray to handle. Some have added 2 to 3 lb. of bluestone to each 50 gallons, in addition to the 15 lb. each of lime and sulphur. This spray should be applied hot. This is one of the best for San José Scale.

Codling Moth.—It is well to make early arrangements for fighting the Codling moth, and while arsenite of soda has proved to be much superior to the Paris green for fighting this pest, it is now claimed by many in America that the arsenate of lead is even better than the arsenite of soda.

First Spraying.—Use 3 lb. of arsenate of lead to 50 gallons of water. The application should be given just as soon as most of the petals have fallen.

Second Spraying.—To follow about three weeks after the first, using 2 lb. of arsenate of lead to 50 gallons of water. Subsequent sprayings may be given at intervals of every four weeks if the moth is bad, using about 1½ lb. of arsenate of lead to 50 gallons of water. This spray is recommended by G. W. H. Valch (*California Fruit Grower*).

In spraying trees with this or any other spray, see that a good pressure is kept up, so that the pump will throw a good fine mist, and be particular to cover the inside as well as the outside of the tree, and also the whole of the fruit.

If the spring proves to be a wet one it is advisable to spray any trees which have in previous wet years shown signs of fungous diseases, such as Peach Curl of the peach-tree, Black Spot or Scab of the apple, Black Spot of the grape-vine—and growers of Gordo Blanco and Sultana vines will have to keep a sharp lookout and keep the spray pumps going—else the crops will be lost.

Bordeaux Mixture will be found the best spray at this time of the year for all fungous diseases. Should the San José Scale put in an appearance after the leaves have started on the tree, the resin, soda and fish-oil wash will be found the best to use at this season of the year.

Never spray either trees or vines while they are in bloom, or the chances are that the crop will be destroyed. They may be sprayed a week before coming into bloom and a week after the fruit is set.

Farm Notes.

Hawkesbury District—September.

H. W. POTTS.

No farmer could wish for more favourable conditions than exist this season to commence sowing and planting the spring crops. The rainfall of last month fell in soaking slowness and at sufficient intervals to penetrate and saturate the dried-out subsoils without leaching. A store of subsoil moisture is now held to provide all our requirements for rapid germination and early growth. We will benefit by the incoming genial warm days of September, through which our pastures will afford plenty of green feed. The winter crops already give evidence of a good harvest. In consequence, the farmer will be occupied fully this month in preparing the soil for summer crops, and getting them in. It should be a month of exceptional activity if advantage be taken of the season and the most favourable cicumstances under which the spring is ushered in. The greater part of last month was taken up in opening up drains, road-making, tree and hedge planting, and ploughing.

Maize.—The first consideration for this district is the main crop—maize. The soil is ready. An ample supply of moisture exists in the subsoils. Given a good season, the Hawkesbury will continue to maintain its reputation as a maize-growing district. In years past buyers have always willingly recognised the quality and value of Hawkesbury corn. Growers know their profit by the weight per bushel and yield per acre. It is fair to anticipate a remunerative return this year, more particularly in regard to yield per acre. It is customary to divide the various varieties of maize into two main sections, those required purely for grain, and the second group for green-feed or ensilage. With the latter class it is possible to produce a large yield of succulent forage at the time when our hot weather sets in and grass disappears. Moreover green maize is highly digestible, very relishable, and undoubtedly a reliable milk producer. It lasts throughout the summer. It also affords the most suitable of all fodders for conservation as ensilage to carry on the work of stall-feeding during the winter months. Milk production has now become a settled industry in the Valley, not only for the supply of the metropolitan population as milk, but also in supporting the Pitt Town Condensed Milk Factory. This industry has had a precarious struggle through the initial stages of its development. Happily that is past, and it is now being realised that the factory has reached its full-grown stage, has come to stay, and is turning out a product worthy of the highest market price and a credit to the district.

Our farmers, moreover, are getting into dairying methods. Silage is being conserved; stall feeding is being introduced; and the returns are of such an

attractive nature that the Valley is sure of being converted into a dairying centre. Owing to its vigorous habit and immense yield per acre, maize may be looked upon as an ideal fodder for cattle in summer. It can be utilised in so many ways, and is the least expensive of all crops to grow. We have to look for a variety of a branching habit: in other words, one that will throw off three to four suckering stalks from the main stem. These cover the main root, gradually thicken, and provide a heavier and more succulent yield than the single-stemmed sort selected for grain. Early and rapid growth has also to be considered as important factors in their selection.

Amongst those found responding best to these requirements are Hickory King, Early Mastodon, and Iowa Silvermine.

For this purpose, viz., green feed or ensilage, drills should be struck out 3 feet apart, and a single seed sown by hand or maize-dropper every 12 inches in the row. Where the soil needs manuring or plant food, it can be supplied through the maize-dropper when sowing, by mixing blood and bone manure with superphosphate in equal parts and applying the mixture at the rate of 1 cwt. per acre. This quantity may be increased in the poorer soils.

In some soils it is an advantage to add muriate of potash at the rate of 50 lb. per acre to the above mixture.

It is important to observe that where large yields of green forage are looked for, cultivation must be practised shortly after planting. The surface must be stirred frequently to stimulate growth early, to check the growth of weeds, and to conserve moisture. We may reasonably anticipate an abnormal growth of weeds this season.

A light harrow will be the best implement until the corn is sufficiently grown to indicate the use of the cultivator and shallow tillage.

For grain, we find other varieties are better yielders, and among them our local farmers have secured the best returns from Red Hogan, King's Early, Golden Beauty, Pride of the North, and Leeming's Early, in the yellow class, and Iowa Silvermine to represent the white varieties.

The customary width between rows to plant is 4 ft. 6 in. When the grain is dropped by hand, three or four grains are planted 3 feet apart in the rows. With the maize-dropper, experience favours planting a single grain from 16 to 18 inches apart.

Where manure is applied in the form of an artificial fertiliser, it is found the best practice to apply one half when planting, and the balance as a top dressing when the crop is 2 feet high and when the last cultivation is effected.

This is done to avoid the growth of a weak, tall, sappy plant. Planting may commence the first week in September and be continued at intervals of a fortnight up to the middle of December for both grain and forage crops. Thus a continuation of feed is provided, as well as an economic distribution of farm labour.

Sorghums.—The question of food production to supplement grazing in a dairying locality must be ever present, and in the allotment of suitable crops for this purpose the value of sorghum cannot be overlooked.

In contrasting the special characteristics of the early life of the maize plant with that of sorghum, it is known that the young maize is much more hardy and vigorous and less susceptible to extremes of temperature than the young sorghum plant, whereas in the mature plant, sorghum is much hardier, and will grow vigorously right into the winter months. The maize plant succumbs to the earliest frosts.

Furthermore, sorghums are more drought-resistant, hence are useful at the end of the summer.

The sorghums are divided into two classes—non-saccharine and saccharine or sugar-producing. In the former class we have the Imphee and Kaffir varieties.

Sorghum may readily be placed second to maize as a forage crop. It can be cut twice, and occasionally a third time, in one season.

Apart from its value as a green fodder, it is found a suitable plant, and most economically handled for conservation as silage. Many farmers practice cutting and stooking it for hay in the autumn. As such it is chaffed in combination with oaten or wheaten hay and lucerne to form a good winter ration.

The crop in this district has been frequently found to give from 15 to 18 tons green feed to the acre. Assuming that the soil has been prepared by thorough cultivation, and manured in a similar way to that for maize, it will be advisable to sow plots for sorghum towards the end of the month. The Early Amber Cane and Planters' Friend sorts are found suitable for the Valley; 7 to 10 lb. of seed to the acre is sufficient. It is better to drill in the seed in rows 3 feet apart.

Cowpeas.—This season will be suitable to test the combination of cowpeas with the crop. The trailing varieties of cowpeas are the best, such as Black, Clay-coloured, and Whip-poor-Will. Black, so far, has turned out the best results. A pea should be planted every 12 inches in the rows.

In our warm climate we are unable to include clovers in the rotation to renovate the soil and restore a special form of fertility, *i.e.*, to transfix atmospheric nitrogen; but we have in cowpeas the best substitute to effect this, as well as provide a quickly-growing forage crop rich in protein, the best class of muscle and red flesh forming ingredients.

It must also be remembered that cowpeas will furnish a good crop on much poorer soils than clover. The cowpea replaces clover with greater advantage, seeing it is, in its richest condition, most palatable and succulent, when other fodders—especially grasses—are dried out with the summer heat. Cowpeas in their green stage furnish a food nearly equal to bran. For all classes of domestic animals in the height of our hottest weather, cowpeas will be found excellent food. If fed off with sheep or pigs, the ground is manured sufficiently for the subsequent crops, especially cereals. It adds nitrogen and humus.

On light sandy soils cowpeas make vigorous growth. Where the soil has been limed it certainly favours the growth of all leguminous crops, including the cowpeas.

A further application of fertilisers, in the absence of farm-yard manure, will be found useful, more particularly where the soil is deficient in plant-food.

The following is recommended :—

Dried blood ...	... ...	150 lb.
Superphosphate	... ...	600 „
Sulphate of potash ..	...	400 „

Apply at the rate of 2 to 3 cwt. per acre. A well ploughed, harrowed, mellow and fine seed-bed is necessary. The soil should be fairly dry and warm. If wet and cold, postpone planting.

Cowpeas can be planted broadcast or in drills. The latter we find more satisfactory, as it enables the farmer to cultivate in order to conserve moisture and suppress the growth of weeds. The best sorts are Black, Upright, Iron, Whip-poor-Will, Clay-coloured, and New Era. Sow in drills 30 inches apart.

Potatoes.—The prospects for potatoes this season are very encouraging. Bearing in mind that potatoes are gross feeders, they fully repay a liberal supply of farm-yard manure. The best state of cultivation is needed. The varieties giving the most certain returns are: Brownell's Beauty, Bliss's Triumph, Early Rose, and Manhattan. Other sorts worthy of a trial are: Aroostook County Prize, Up-to-date, Satisfaction, Royalty, Country Boy, Breese's Prolific, Centennial, Early Red Ruby, and Beauty of Hebron.

To provide against disease the tubers should be soaked for two and a half hours in the following :—

Dissolve 2½ ounces of corrosive sublimate (perchloride of mercury) in 16 gallons of warm water; allow it to cool before using. The solution is poisonous, and great care must be exercised in preventing an accident.

Millets.—Where early green forage is required it is quite possible to sow an early variety of Millet such as the White French, early this month, and have it fit for cutting as forage in the middle of November. It will be ready at a most suitable time, just as the spring grasses are failing. Millet in a green stage is attractive, palatable, and nutritious. It can be used green or conserved as hay or ensilage, and is useful as a fodder for dairy cattle, sheep, and young stock.

Millets have vigorous habits and will thrive on low grade soils, whilst they respond freely to rich, mellow soils. They are useful to sow on foul land that requires cleaning for a late maize crop.

The crop resists drought conditions well. The best method is to sow the seed broadcast, in quantity ranging from 7 to 15 lb. to the acre. This must be determined by the nature of the soil. Thin seeding results in coarse-stalked plants. Should frosts prevail it is well to wait till they are gone.

Pumpkins, Melons, Squashes.—This class of fodder is always highly appreciated, especially in districts liable to drought. They form a nutritious and succulent food for cattle, sheep, and pigs. They need little attention so long as a fairly rich seed-bed is prepared, followed by some cultivation after the seed germinates.

Plant the seed 10 feet apart each way; placing five or six seeds in the one patch or hill, and subsequently thin out to two plants.

In dry seasons the soil must be loosened and the weeds kept under. The best varieties of pumpkin are Crown, Ironbark, Green Button, Turk's Cap, and Red Crown.

Vegetable Marrows.—Green Bush and Long Vegetable.

Squashes.—Custard and Chinese.

Mangolds.—With existing moisture in the soil this crop is worthy of much attention. Mangolds form an excellent food for cattle and pigs, and are digestible and relishable. They may be grown on almost any soil, although deep rich loams are best to produce heavy yields. The Globe and Tankard sorts may be grown on light fallow soils. So long as they have enough moisture for growth during the first two months they can withstand drought, and thrive well with plenty of sunshine.

The soil needs manure, use 10 tons of farm-yard manure to the acre, followed by artificials. Sow 6 to 8 lb. of seed to the acre, ¾ to 1 inch deep, in drills 3 feet apart. Thinning must follow, reducing the growth to one plant 8 to 10 inches apart. Cultivation should be frequent and fairly deep. Mammoth Long Red and Yellow Globe varieties thrive best here.

Jerusalem Artichokes.—The reputation this plant possesses as a drought resister entitles it to more attention at the hands of our farmers.

It is a hardy perennial, and is propagated much in the same way as potatoes, and may be grown on soils similarly suitable. Any odd corner about the farm of ¼ to 1 acre could be set apart. Plant tubers in well-cultivated and manured land about 2 inches deep, and 18 inches from each other, in rows 3 feet apart. Cultivate as for potatoes.

The tubers are cooked as a vegetable, eaten raw as a salad, or pickled in the same way as cucumbers. They have also reputed value as a diuretic and tonic for pigs, and are considered a specific class of food for feeding sows after weaning their litters. The Improved White French is considered the best variety.

Shade Trees and Hedges.—The attractiveness of the home can be vastly enhanced by a judicious system of tree-planting, always provided those sorts are selected which will thrive on the class of soil available and withstand our climatic conditions.

Apart from its æsthetic aspect, tree-planting improves the conditions for protecting stock, in providing shade and shelter in summer and winter. Pastures and cultivated lands are benefited by belts of timber. Similar advantages may be claimed for hedges; the latter, however, must be grown only where they can be kept trimmed and under complete control as regards seeding.

Amongst the best varieties of trees for the district are the Pinus insignis, Peppers, Kurrajongs, Silky Oaks, Planes, Sugar-gums, Blue-gums, White Cedars, and Pines.

In hedges the Japanese Privets, African Boxthorn, Osage Orange, and Honey Locust are suitable.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary.	Date.
Gunnedah P., A., and H. Association	M. C. Tweedie	Sept. 1, 2, 3
Grenfell P., A., and H. Association	Geo. Cousins	,, 2, 3
Parkes P., A., and H. Association	G. W. Seaborne	,, 2, 3
Germanton P. and A. Society	J. Stewart	,, 2, 3
Albury and Border P., A., and H. Society	W. I. Johnson	,, 8, 9, 10
Young P. and A. Association	G. S. Whiteman	,, 8, 9, 10
Cootamundra A., P., H., and I. Association	T. Williams	,, 15, 16
Molong P. and A. Association	C. E. Archer	,, 16
Cowra P., A., and H. Association	E. A. Field	,, 16, 17
Corowa P., A., and H. Association	J. O. Fraser	,, 22, 23
Guyra Horse Parade and Poultry Show	......	,, 23
Temora P., A., H., and I. Association	John Clark	,, 22, 23, 24
Wyalong District P., A., H., and I. Association	Thos. A. Smith	,, 29, 30
Queanbeyan P. and A. Association	E. O. Hinksman	Oct. 1
Bega A., P., and H. Society (Spring Show)	W. A. Züegel	,, 7
The Lachlan P. and A. Association	Thos. Cadell	,, 29
Adelong P. and A. Association	A. W. Molineaux	,, 13, 14
Menindie A. and P. Society	L. E. Underdown	,, 28
Lismore A. and I. Society	T. M. Hewitt	Nov. 11, 12, 13
Berry Agricultural Association	A. J. Colley	,, 24, 25, 26, 27

1909.

Society.	Secretary.	Date.
Dapto A. and H. Society	G. A. McPhail	Jan 13, 14
Kiama A. Association	R. R. Somerville	,, 26, 27
Alstonville A. Society	W. W. Monaghan	Feb. 3, 4
Wollongong A., H., and I. Association	F. W. Philpotts	,, 4, 5, 6
Moruya A. and P. Society	John Jeffery	,, 10, 11
Shoalhaven A. and H. Association, Nowra	Henry Rauch	,, 10, 11
Guyra P., A., and H. Association	......	,, 16, 17
Kangaroo Valley	E. G. Williams	,, 18, 19
Manning River A. and H. Association, Taree	S. Whitehead	,, 24, 25
Gunning P., A., and I. Society	W. T. Plumb	,, 25, 26
Tenterfield P., A., and M.	F. W. Hoskins	Mar. 2 to 6
Bega A., P., and H. Society	W. A. Züegel	,, 3, 4
Berrima District A., H., and I. Society, Moss Vale	I. Cullen	,, 4, 5, 6
Molong P. and A. Association	Charles E. Archer	,, 10
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 10, 11
Gloucester Show	Edward Rye	,, 11, 12, 13
Newcastle A., H., and I. Society	C. W. Donnelly	,, 11, 12, 13
Inverell P. and A. Association	J. McIlveen	,, 16, 17, 18
Camden A., H., and I. Society	C. A. Thompson	,, 17, 18, 19
Blayney A. and P. Association	E. J. Dann	,, 23, 24
Hunter River A. and H. Association	C. J. H. King	,, 23, 24, 25
Yass P. and A. Association	Will Thomson	,, 24, 25
Mudgee A. Society	H. Lamerton	,, 24, 25, 26
Clarence P. and A. Society, Grafton	T. T. Bawden	,, 24, 25, 26
Upper Hunter P. and A. Assoc., Muswellbrook	J. M. Campbell	,, 31 Apl. 1, 2
Bathurst A., H., and P. Association	G. W. Thompson	Mar. 31 Apl. 1, 2
Durham A. and H. Association, Dungog	C. E. Grant	May 5, 6

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Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 712.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XIX.

Trees other than Conifers and Palms:

Urticaceæ (Elms and Figs).

FOR the purpose of this article I will call it the Elm and Fig family. It comprises many other genera than those I have chosen; for example, it includes the nettles. Very interesting trees are certain New South Wales members of this family, which are being dealt with in my Forest Flora of New South Wales.

Dealing with the eight genera of trees I will bring under review in this article, the following two tables show the classifications adopted by eminent botanists:—

A. "GENERA PLANTARUM" of Bentham and Hooker.

Urticaceæ—

Tribus 1.—*Ulmeæ.*

Ulmus.	Planera.
Holoptelea.	

Tribus 2.—*Celtideæ.*

Zelkova.	Celtis.

Tribus 4.—*Moreæ.*

Maclura.	Morus.

Tribus 5.—*Artocarpeæ.*

Ficus.

B. Engler's "PFLANZENFAMILIEN."

Urticales.

Ulmaceæ.

Ulmus.	Zelkova.
Holoptelea.	Celtis.
Planera.	

Moraceæ.

Morus.	Ficus.
Maclura.	

Select Bibliography.

Gamble, J. S.—"Manual of Indian Timbers" (1902 Edition).

King, G.—The species of Ficus of the Indo-Malayan and Chinese Countries.

Part 1—Palæmorphe and Urostigma (1887).

Part 2—Synœcia, Sycidium, Covellia, Eusyce and Neomorphe (1888). Ann. Roy. Bot. Gard., Calcutta, i.

Loudon, J. C—Arboretum et Fruticetum Britannicum. Vol. III, pp. 1342-1420.

Mueller—"Select extra tropical plants."

Sargent—"Silva of North America." Vol. VII.

Weddell, H. A.—Monographie de la Famille des Urticées. *Archives du Muséum*, t. IX, Paris, pp. 592, with 20 plates.

ULMACEÆ.

The Elms (*Ulmus*).

There are about twenty species, confined to the colder and temperate regions of the northern hemisphere, while the cultivated forms amount to a very great many.

On this point Loudon, p. 1375, says :—

> These are very numerous, both in Britain and on the Continent; and most of them have been selected by nurserymen from their seed-beds. Any one, Baudrillart remarks, who has ever observed a bed of seedling elms, must have noticed that some have large leaves, and some small ones; some are early, some are late; some have smooth bark, and some rough bark; and some soft leaves, and others very rough ones. Some varieties are higher than others; the branches take now a vertical, and again a horizontal, direction. In short, while botanists describe, and cultivators sow, they will find that nature sports with their labours, and seems to delight in setting at fault alike the science of the one and the hopes of the other. This is always the case with plants that have been long submitted to the cultivation of man. The cares that are bestowed upon them, the different situations in which they are placed, and the different kinds of treatment which they receive, appear to change their native habits. (See *Dict. des Eaux et forêts*, ii, p. 460.)

Elms, speaking generally, require rich, deep, moist, alluvial soils in the coldest parts of New South Wales. The Elms of Tumut, for example, are remarkably fine.

Elms seem to require cool winters for their proper development. I am sorry to hear that the fine Elms of Wagga Wagga are doomed. Beautiful to look at, they are becoming a prey to boring beetles. The summer heat and warm nights with insufficient accentuation of cold during the winter, appear to induce in these trees debility which renders them an easy prey to insects.

Elms of the Old World.

1. *U. campestris*, L. The Common Elm of Europe. It extends to North Africa. See t. 232 of Bentley and Trimen's "Medicinal Plants." The Common Elm does very well in Melbourne and Adelaide; it succeeds far less in Sydney. In Europe it is very abundant, being used both in parks and for street and avenue planting.

The timber of the Elm is tough, and remarkably durable under water. It was formerly employed in making water-pipes before these were superseded by iron ones. Coffins are commonly made of it in Europe.

The dried inner bark is official in the British Pharmacopœia, possessing mild astringent tonic and demulcent properties.

Ulmus campestris, L.
State Nursery, Campbelltown.

L 15. See photo of a tree, State Nursery, Campbelltown. Planted seven years, 12 feet high.

There are many varieties or horticultural forms of the Common Elm. For example, we have the following in New South Wales :—

U. suberosa, Sm. The Cork-barked Elm. See Sowerby, *Eng. Bot.* t. 2161. The bark of this form develops more or less thick and ridged corky wings.

Ulmus campestris, L. var. umbraculifera, Trautv.
State Nursery, Campbelltown.

There is a tree in the Government Domain.

U. campestris var. *umbraculifera*, Trautv. Of the tree shown, which is in the State Nursery at Campbelltown, Mr. J. McEwen says, "planted seven years, 12 feet high. The most compact and symmetrical grower of all the Elms." See photo.

At the State Nursery, Campbelltown, we have also the so-called varieties *Chester* and *amplexicaulis*.

2. *U. scabra*, Miller (Syn. *U. montana*, Withering). Here is an instance in which a name long in use in New South Wales must give way to the laws of botanical priority. Native of Europe, North Africa, Central Asia to China and Japan.

This includes:

U. montana, Withering. The "Wych Elm," "Scotch or Mountain Elm," or "Dutch Elm." This is the native Elm of England. Bows were made of the wood of the Wych Elm, which were considered only second in quality to those of Yew. See Syme. *Engl. Bot.* t. 1287.

The Huntington Elm is placed by Loudon, iii, 1404, under *U. glabra*, Mill (the Smooth-leaved or Wych Elm), variety *regeta*, of which he gives *U. montana regeta* as a synonym. This is, according to Loudon, by far the most vigorous kind of Elm propagated in British nurseries, "the fastest grower, and produces the best timber of all elms." For an account of its origin see Loudon *loc. cit.*

There is a specimen in the State Nursery, Campbelltown. It is the fastest grower of the Elms in Sydney except the "Canadian Giant." Also L 15.

The photo is that of a specimen of *U. montana* in the State Nursery, Campbelltown. It is 22 years old. Mr. McEwen reports:—"Height about 50 feet: upright growth. Well suited for this district. All the Elms grow well here."

There is also a photo of a fine tree in the Government Domain.

Ulmus "Canadian Giant" is also a variety of *montana*, and is the quickest grower in Sydney. It is rather more spreading than the ordinary form. There is a specimen on the sloping lawn, nearest Government House, and looking towards the sea-wall.

There is a photo of a specimen in the State Nursery, Campbelltown. "Planted seven years; 12 feet: steady growth." (J. McEwen.)

We have *U. montana* var. *purpurea* in Campbelltown, and it, like many others, is listed by the Sydney nurserymen. It owes its name to the purplish leaves, but they do not colour well in Sydney. There is a specimen in the Government Domain.

See photo of a tree, State Nursery, Campbelltown. "Planted twenty-two years ago. Wide spreading habit. About 20 feet high." (J. McEwen.)

3. *U. parviflora*, Jacq. (syn. *U. chinensis*, Pers). The Chinese Elm.

I draw special attention to the fact that *U. chinensis*, being a later name, has been suppressed by modern botanists. The name is widely in use in New South Wales, and convenient, but we must drop it, whether we like it or not.

It is native of Thibet and Northern China and is a beautiful species. It does well in Sydney. There used to be a fine plant at Admiralty House, but it had to be removed for structural alterations. The beautiful tree on the band-house lawn, Sydney Botanic Gardens, failed to unfold its leaves in the spring of 1905. The droughty years had been punishing it severely.

Ulmus montana, With.
State Nursery, Campbelltown.

There is also a tree in the Garden Palace Grounds.

See photo of tree in State Nursery, Campbelltown. "20 feet high. Planted about twelve years. Does well here. A fine tree." (J. McEwen.)

4. *U. lancifolia*, Roxb. The Himalayan Elm. Native of the sub-tropical forests of the Sikkim Himalaya (Central and Eastern Himalaya up to 5,000 feet). Khasia Hills up to 3,000 feet, Chittagong and Burma.

Ulmus montana, With.
Government Domain, Sydney.

"This is a large deciduous tree ; wood light red and hard." (Gamble.)

5. *U. Wallichiana*, Planchon.

See Brandis' "Forest Flora," 432, t. 51.

A large deciduous tree. Found in the Western Himalaya from the Indus to Nepaul in ravines at elevations varying from 3 to 10,000 feet.

Ulmus montana, With., var. "Canadian Giant,"
State Nursery, Campbelltown.

Gamble (*op. cit.* p. 627) speaks of it as a large tree with a fine timber, which deserves to be much better known that it is as a furniture wood.

American Elms.

6. *U. alata*, Michaux. The "Wahoo" or "Winged Elm" of the United States.

Ulmus montana, With., L. var. purpurea.
State Nursery, Campbelltown.

Figured by Sargent at t. 313 also at t. 233, of Bentley and Trimen's "Medicinal Plants." Called "Winged Elm" in allusion to the corky wings of the branchlets.

A tree of medium or small size which usually grows on dry gravelly uplands and sometimes in rich alluvial soil on the borders of swamps and banks of

Ulmus parviflora, Jacq. (U. chinensis, Pers.).
State Nursery, Campbelltown.

streams. It is a native of the warmer United States, not extending to the Pacific. Sargent says that it grows to its largest size and most abundantly in the region west of the Mississippi River.

It should, therefore, be easy of introduction into New South Wales. "The good habit, rapid growth, small size, and abundant foliage of the Wahoo make it a desirable ornamental tree, and it is often planted in the Southern United States to shade the streets of towns and villages." (Sargent.)

7. *U. americana, L.* The "White Elm" or "Water Elm" of the United States.

This is figured by Sargent at t. 311 of his "Silva of North America," and Pinchot has published Circular 66 of his Forest Planting Leaflets concerning it. (U.S. Department of Agriculture.)

It is a very large and graceful tree, and extends from Newfoundland here and there as far south as Texas. Like most Elms it flourishes best in deep, well-drained alluvial soil. At the same time it is very accommodating both as regards moisture, quality of soil and temperature.

It is said to be very liable to borers in its native country.

Its timber is valuable for cooperage, flooring, wheels, ship-building, and agricultural implements. It is, however, not durable.

It is a specially valuable tree for ornamental and protective planting. Its seeds do not retain their vitality long, but it is readily propagated from suckers.

8. *U. crassifolia*, Nuttall. The "Cedar Elm" of the United States.

Figured by Sargent at t. 315 of his work.

A tree of medium or large size occurring in some of the warmer parts of the United States, *e.g.* Mississippi, Southern Arkansas, and Texas. In Arkansas it grows usually on river cliffs and low hillsides.

"As it grows on the bottom lands of the rivers of Central Texas, the Cedar Elm, with its broad head of long pendulous branches, covered with dark green lustrous leaves, is one of the most beautiful and graceful trees of North America. It is occasionally planted as a shade tree in the streets of cities and towns in Texas, but except in Texas it is rarely seen in cultivation." (Sargent.)

It seems, therefore, the likeliest of the American Elms to flourish in coastal New South Wales.

9. *U. fulva,* Michaux. "The Slippery or Red Elm" of Eastern North America.

Sargent figures this tree at t. 314 of his celebrated work, and quotes *U.? pubescens?* Walter, as a doubtful synonym. On the other hand, Pinchot in his Forest Planting Leaflet, Circular 85 (U.S. Dept. of Agriculture), treats of the Slippery Elm as *U. pubescens* without doubt. As these two eminent American dendrologists and foresters differ, we will leave it at that.

The vernacular names are owing to the mucilaginous character of the inner bark and the reddish tint of the trunk.

It is a native of Ontario, Canada, and occurs south to Florida, the Mississippi, and Texas, so that the tree may be reasonably expected to flourish in parts of New South Wales. It inhabits the banks of streams and low rocky hillsides, where it grows in deep, fertile soil.

Its wood is heavy, hard, strong, close-grained, and durable.

It is, however, best known from the thick fragrant inner bark of the branches, which is mucilaginous, demulcent, and slightly nutritious; it is used in febrile affections and externally in the form of poultices. Sargent says it is in cultivation a handsome, shapely, fast-growing tree; but he states that in public parks and streets its use is to be avoided, for once its identity is established it usually falls a prey to boys eager to devour the inner bark of the branches. This, of course, applies to American boys, and it is presumed that Australian boys will be a long time finding out its toothsomeness.

10. *U. mexicana*, Planchon. The one species of Mexico, occurring in the Cordilleras of South-western North America. Mueller states that this elm attains a height of 60 feet, or perhaps more.

11. *U. penduncula*ta, Fougeraux (*U. lævis*, *Pallas*; *U. ciliata*, Ehrhart). Europe and Asia through the middle zone. Stated by Mueller to be a fine avenue tree.

12. *U. racemosa*, Thomas. The "Rock Elm" or "Cork Elm" of the United States. Figured by Sargent at t. 312.

A large tree, native of Canada, through the Eastern United States as far south as Tennessee.

Sargent says it grows on dry gravelly uplands commonly in company with the Sugar Maple. It attains its largest size in Ontario (Canada) and Michigan.

Its timber is heavy, hard, very strong and tough, close-grained and susceptible of receiving a good polish, and Sargent says that the value of the wood of this tree threatens its extinction. He, however, points out that it is a handsome and distinct ornamental tree, which planters have too generally neglected.

The Indian Elm (*Holoptelea*).

1. *Holoptelea integrifolia*, Planchon. (*Ulmus integrifolia*, Roxburgh.) The Elm of India, extending from the lowlands to sub-alpine regions. A large tree, with timber of good quality. Foliage deciduous.

The above is taken from Mueller, "Select Extra Tropical Plants," the tree being recommended for New South Wales. I do not, however, know of a tree in Sydney. I will, however, try to introduce it.

Gamble speaks of it as "a common tree, but of little importance." It is usually much branched or twisted. The wood is strong, but is used but little. Brandis mentions its use for building, carts, and carving. The leaves are lopped for cattle fodder.

The Water Elms (*Planera* and *Zelkova*).

1. *Planera aquatica*, Gmelin. The Water Elm of the United States. Figured at t. 316 of Sargent's work.

A tree of medium size, native of deep swamps in the Central United States. Comparatively rare and confined to the neighbourhood of the coast in the Atlantic and Eastern Gulf States. The Water Elm is very abundant in Western Louisiana and Southern Arkansas, where it attains its largest size (Sargent). Deciduous.

It does not appear to be of economic importance, but it is an interesting tree suitable for cultivation in swampy country in the warmer parts of New South Wales, and indeed up to a moderate elevation.

1. *Zelkova acuminata*, Planch. (*Syn. Planera acuminata*, Lindl.) Native of Japan. Deciduous.

A small tree with us, in a damp situation ; a very old plant, and we cannot speak much in regard to one specimen, but it is certainly worthy of trial in cold, moist districts.

L 19.

2. *Z. crenata*, Spach. (*Planera Richardi*, Michaux.) The foliage strongly resembles the Elm, but the bark more resembles that of the Plane than that of the Elm. This and *Planera* may be grafted on the Elm (*Treasury of Botany*). Mueller (*Select Extra Tropical Plants*) gives the following account of it :—"South-Western Asia, ascending to 5,000 feet. In favourable localities a good sized tree, with qualities resembling those of the Elms. Growth of comparative celerity. Wood never infested by insects, also otherwise very durable, fine-grained, heavy and hard."

It forms a small tree with us, but it is in rather a well-drained situation.

The allied *Z. cretica*, Spach. is restricted to South Europe. Resists severe frosts. Its tendency to form straight and tall stems and few and short branches is evident. Attains an age over 200 years ; rate of growth about 2 feet a year. The wood is pale yellowish and streaked, tough and elastic, neither rends nor warps, also under ground the wood is almost imperishable. Medwedieff calls this tree the Pearl of the Caucasian forests. The propagation is either from seeds, or layers, or cuttings. (H. Scharrer.)

U near D 2.

The Nettle-trees (*Celtis*).

1. *Celtis australis*, L.

The Nettle-tree of Europe. Native of South Europe, North Africa, and South Asia. The specific name *australis* means "Southern" and only secondarily "Australian."

A tree of medium height, with smooth trunk and long flexible branches.

The tree is deciduous, and the small greenish flowers are produced at the same time as the leaves.

In New South Wales it stands dry and cold as well as hot situations, imitating *Grevillea robusta* much in this respect. It is not cultivated for avenues or specimen trees as frequently as its merits demand. It is a great favourite for this purpose in France and Italy.

"The fruit, which when ripe is blackish and resembles a very small withered wild cherry, is said not to become edible until the first frosts, and it hangs on until the following spring. It is remarkably sweet, and is said to have been the Lotus of the ancients. Homer says it was so delicious as to make those who ate it forget their native country. The berries are still eaten in Spain, and Dr. Walsh says the modern Greeks are very fond of them."

"The wood of the branches is elastic and supple. Its compactness renders it susceptible of a high polish and when it is cut obliquely across the fibres it much resembles Satin Wood. It is used for furniture and carving, and its branches are extensively employed in making hay forks, coach whips, ramrods, and walking sticks, according to Loudon." (*Treasury of Botany.*)

Gamble also draws attention to the conspicuous pores on a vertical section, and says that in Southern France, where the wood is much esteemed for oars, tool handles, sticks and other purposes requiring toughness and elasticity, this tree is cultivated in small closely-grown coppice-woods in order to meet such requirements. Here is a minor forestry industry available to many small farmers in New South Wales. Gamble says that in the Western Himalaya it is often planted to be lopped for cattle fodder. On these grounds alone the tree is worthy of extended trial in a cattle and horse-oreeding country like New South Wales.

2. *C. occidentalis*, L. "The Blackberry or Sugarberry tree."

Native of Central North America, from the Pacific to the Atlantic, extending from Canada to Florida. Figured in Sargent's "Silva of North America," t. 317.

The United States Department of Agriculture has published a Forest Planting Leaflet (Circular 75) dealing with this tree.

It is usually characterised by a single stem with warty bark and a broad conical crown. It is a tree of good size. In the Middle West it is extensively planted for a shade tree, and it is recommended for admixture with other species in wind-breaks.

It should be an excellent tree for our table-lands. It is but shrubby at Campbelltown, in our experience.

Pinchot remarks that it will of course thrive better on a fertile soil than on a poor one, but the ability to grow on almost sterile soils is one of its best qualities. "It is characteristic of the tree to live and bear seed in situations where almost any other tree would die. In the more humid regions it grows on dry and sometimes almost barren soil, while in the semi-arid plains it thrives best along the watercourses. A limestone soil seems to be especially favourable. It will not endure swampy soil." (Pinchot).

It does not seem a specially valuable timber, but as a living tree for treeless country it seems to be specially indicated.

MORACEÆ.

The Mulberries (*Morus*).

1. *Morus alba*, L. The "White Mulberry." The Mulberry usually employed for silkworm culture.

A native of temperate Asia. When wild or semi-wild the fruit is small and rather dry, but under proper cultivation the tree yields several very good varieties.

Neither here nor in the United States has the silkworm industry attained commercial importance. The subject comes into the domain of the Entomologist, and there is a voluminous literature, even in Australia, concerning it. Several articles will be found in back numbers of this *Gazette*. The United States Department of Agriculture has published a useful "Farmer's Bulletin" No. 165, on "Silkworm Culture," by Miss Henrietta Aiken Kelly, Special Agent in Silk Investigations, Division of Entomology. This lady studied the subject in France and Italy for a number of years.

Most works on Sericulture also contain references to the cultivation of the White Mulberry, so there is no difficulty in obtaining access to literature.

Bulletin No. 34 of the Bureau of Plant Industry of the United States Department of Agriculture, by George W. Oliver, is valuable. See also Mueller's "Select extratropical plants."

The White Mulberry is very hardy, standing much drought, is readily grown, both by seeds and cuttings, and although it seems a far cry for Australia to compete with the highly trained technical labour of France and Italy, poorly paid according to Australian standards, my view is that, in the course of years, practically every industry dependent on the cultivation of plants will be undertaken in this country of broad acres and many climates. So that the White Mulberry, one of the important trees of the world, is one whose cultivation should be undertaken (on a limited scale at present) in every district in which it can be persuaded to flourish. Then, when the right sericulturists come along (and sericulture will probably be a "petit culture" in Australia for many years, an adjunct to the farm, for the young people, and those in feeble health) we shall not be confronted at the threshold with the statement that an all-essential factor—food for the silkworms—is not available.

L 15 a.

There is a variety (var. *tatarica*, Loudon, = *M. tatarica*, L.) of the White Mulberry, known as the "Russian Mulberry," and Circular No. 83 of the U.S. Dept. of Agriculture (Forest Planting Leaflet) deals with this plant. See also L. H. Bailey, Bulletin No. 46, *Cornell. Univ. Agric. Expt. Station.*

It is low and bushy, is a very hardy variety, and was introduced into the United States by the Russian Mennonites about 1875. "It will endure almost any amount of drought and neglect." It is common now in the Middle West United States.

It is stated that its wood is valuable, but I do not attach too much importance to that so far as New South Wales is concerned. It is certainly a valuable subsidiary silkworm plant, it is useful as a wind-break, and it promises to do well in bleak, cold, arid country.

It does not appear to have been introduced into New South Wales, but I am taking steps to rectify the omission.

2. *M. nigra*, L. "The Black Mulberry tree." See t. 229, in Bentley and Trimen's "Medicinal Plants." Native of south-western Russia and Persia.

This is the tree which produces the luscious mulberries so much esteemed by many. It has large, coarse foliage, and given low-lying, damp situations,

it is not particular whether the climate is cold or hot. It flourishes in many parts of New South Wales, and seems equally at home in Tasmania and South Australia, in moist and dry climates respectively.

If I say too much about this tree I shall be poaching on the domain of the Fruit Expert, but I have no hesitation in saying that the mulberry is, regrettably, a much neglected tree in New South Wales.

3. ***M. rubra***, L. "The Red Mulberry Tree." Figured in Sargent, "Silva of North America," t. 320. Native of Eastern North America and North Mexico.

It appears to be the largest tree amongst the mulberries, and Sargent states it attains its largest size in the basin of the Lower Ohio River and on the foothills of the Appalachian Mountains.

The fruit is at first bright red when fully grown, but afterwards becomes dark purple. It is inferior as an edible fruit since horticulturists have raised better forms, but as a beautiful shade-tree and also as food for silkworms in the coldest localities of New South Wales, it is well worthy of cultivation by all lovers of trees.

The Osage Orange (*Maclura*).

1. *Maclura aurantiaca*, Nutt (*Syn. Toxylon pomiferum*, Raf.). "Osage Orange." Native of Southern United States.

Usually in New South Wales it is only known as a hedge plant. I hope to deal with hedge plants for New South Wales in a subsequent article of this series, but would draw attention to the fact that in the colder parts of this State, in rich, moist, bottom lands, it becomes a medium-sized tree. Its elastic yellow wood is called Bow-wood, from its being used by the Indians for making bows. See also *Gardeners' Chronicle*, 1894. Figure 88.

At the same time—and this is a great recommendation —it is most accommodating as to soil and climate.

It forms the subject of a Forest planting Leaflet, Circular 90, of the United States Department of Agriculture, where it is recommended as a timber tree. Mr. Pinchot says that in its native country it rarely succumbs to drought, and this ability to withstand aridity makes it one of the most desirable trees for planting throughout the Middle West United States.

It is recommended for fence-post material, and is used "in the manufacture of machinery, waggon-felloes, insulator-pins, and tool-handles. Where the tree attains sufficient size the wood is used for railroad ties (sleepers)."

Of course New South Wales is one of the principal countries of the world producing hardwoods, and the commercial importance of the Osage Orange as a timber tree, under our conditions, remains to be proved. But trees suitable for arid conditions should always be persevered with.

The fruit, like a coarse orange, is well known, and the plant itself is propagated readily from seeds, suckers, and stump sprouts. Its tendency to profuse branching, which is an excellent character in a shade tree, is checked by close planting.

The leaves of the Osage Orange are readily eaten by silkworms.

M 9; L 29 c.

Cheese-making on the South Coast of New South Wales.

W. GRAHAM,
Dairy Branch, Department of Agriculture.

THE southern end of the South Coast of New South Wales is commonly known as the cheese district of this State; although there are other districts where cheese is made successfully.

Methods.

In the endeavour to make a good saleable cheese, most of the factories and dairymen work on the Cheddar principle, and I think I am quite safe in saying that there is no other system so well adapted for this warm climate. To prevent loss, deterioration in flavour, and also have a good market appearance, we require a firm-bodied cheese, and in the Cheddar principle this is easily obtainable. Some dairymen still make on the old American acid system, but I am pleased to say that this method is gradually dying out. With this, as in all soft cheeses, where the climate is warm, the flavour goes off very quickly, owing to the excessive moisture they contain; hence the keeping quality is not so good. A mild, clean flavour is what the market demands, and by the Cheddar system we are better able to produce cheese of that class.

Care of the Milk on the Farm.

Too much attention cannot be exercised in the care of milk if we wish to produce a good-flavoured cheese. It is necessary that the cows' teats should be washed, and any dirt sticking to the udder, or legs, should be removed before commencing to milk. The hands of the milkers should be washed regularly. The clothes of the milker should also be clean. Each cow's milk should be strained immediately after the cow is milked. A good strainer should be used, so that all particles of dirt, hair, &c., are removed. A fine wire strainer is recommended, as it is a difficult matter to keep a cloth strainer clean, and very often they become a source of contamination, instead of being a purifier.

Aëration after Milking.

Aëration, when carried out in a clean atmosphere, is beneficial to the milk for cheese-making purposes. By aëration food flavours, which taint the milk, are allowed to escape, and, although they may not be removed altogether, are much reduced. It also assists in the cooling of the milk. Aëration is strongly recommended, as the benefit is great, but it should not be carried out if the operation has to take place where the atmosphere is not pure,

such as close to manure heaps, fowl pens, stables, &c. A sketch of the Canadian Milk Aërator, which is one of the cheapest and simplest of its kind, is shown in fig. 1.

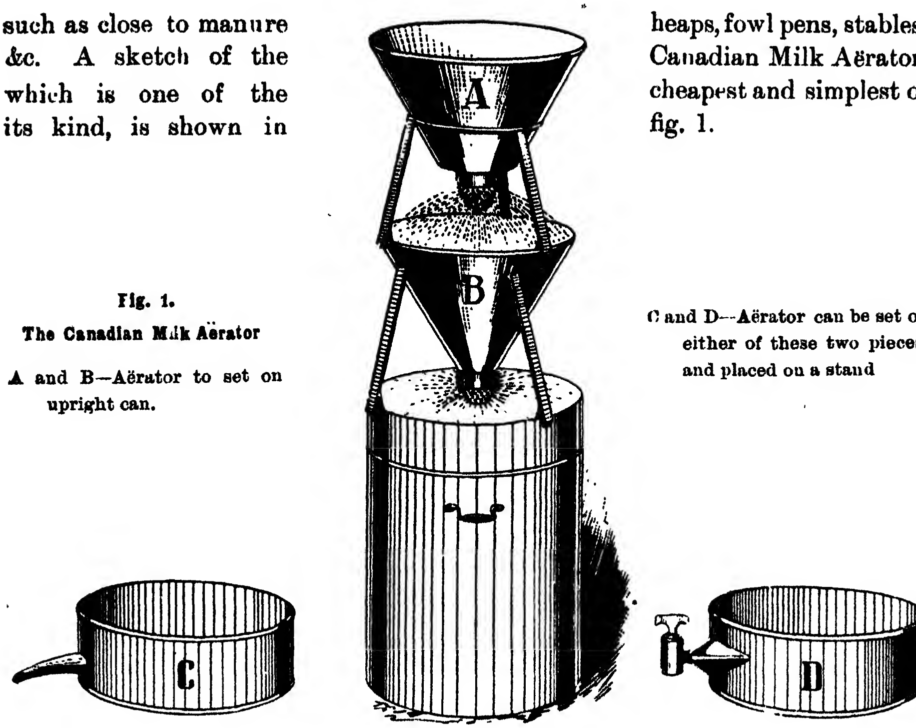


Fig. 1.
The Canadian Milk Aërator

A and B—Aërator to set on upright can.

C and D—Aërator can be set on either of these two pieces, and placed on a stand

Cooling of the Evening's Milk.

By cooling milk we reduce the temperature, and by reducing the temperature the activity of the germs that cause souring is checked. The most favourable temperature to hold milk for cheese-making purposes is 65° Fahr. A certain development of lactic acid is essential to keep the undesirable organisms in check, and it will be found that the best results will be obtained at that temperature. It is to be regretted that there are not much better methods adopted in the cooling of the night's milk than those which at present exist in the average South Coast dairy, In fact, in some places no attempt is made to cool the milk ; it is simply allowed to stand until the morning, when it is generally in an over-ripe condition—it is impossible for any cheese-maker to make good cheese out of over-ripe milk —and the majority of complaints which arise are due to the fact that proper care and attention have not been given to the night's milk. Every up-to-date dairy farmer should have facilities for cooling the night's milk. The little expense incurred in erecting a small building to cool and keep the milk in would be returned in the increased price obtained for the product. A concrete tank in the ground to catch the rain-water from the roof of the milking shed, an elevated 400 gallon iron tank, a small hand pump, and a small spiral cooler are the necessary appliances. The water, after circulating through the cooler and performing the operation of cooling the milk, can be allowed to run back into the underground tank. A sketch of a small dairy and cooling apparatus, which are within the means of every dairy farmer, are shown in figs. 2 and 3.

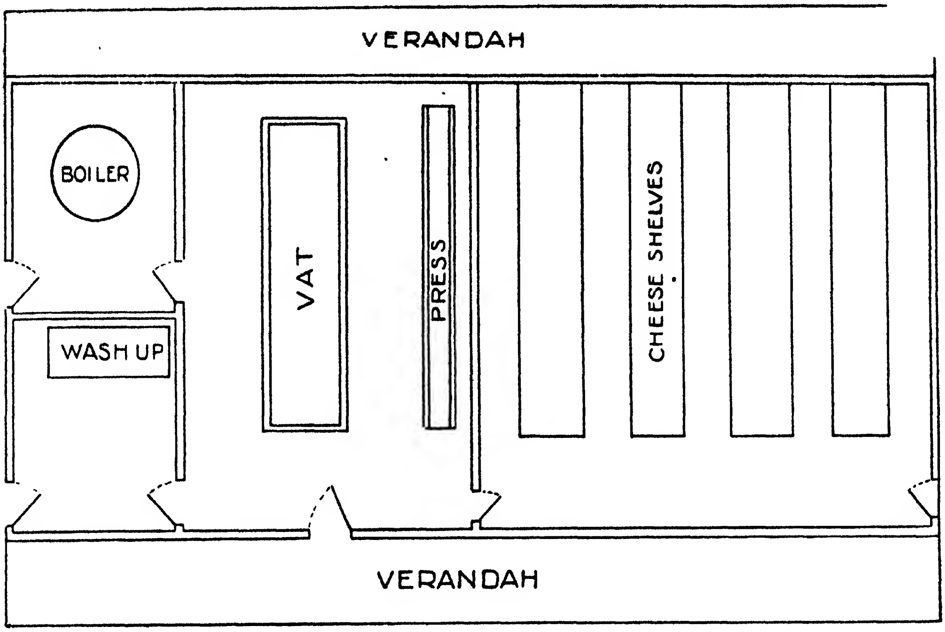


Fig. 2.—Plan of a small Dairy.

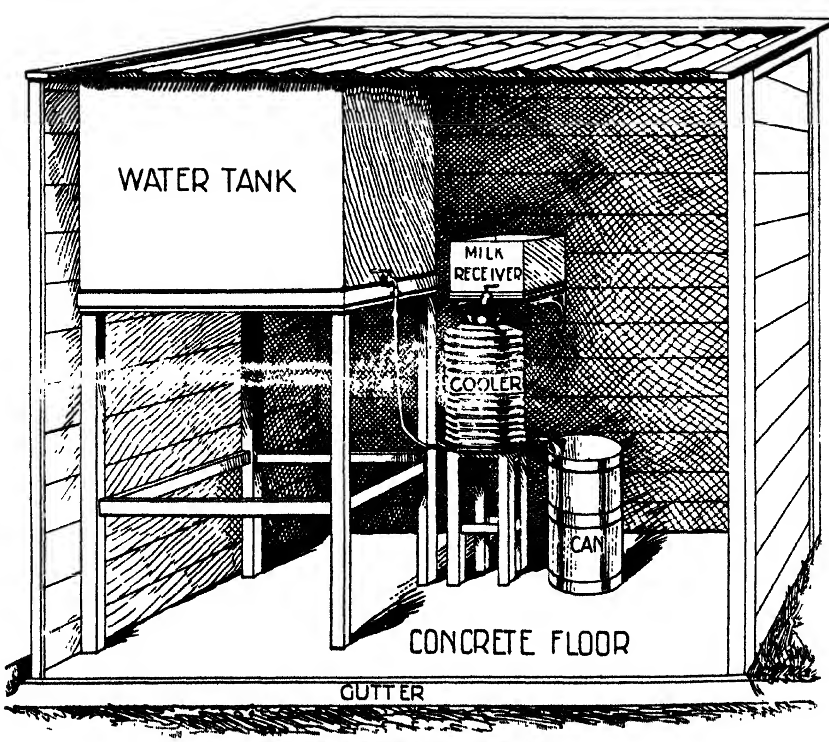


Fig. 3.—Milk-house and Cooling Apparatus

Starter.

A good starter is beneficial in the manufacture of cheese, and at no time should the cheese-maker be without one. Practical experience has proved that a good clean-flavoured starter can be used at all times with good results. Cheese-makers often blame starters for faults in their cheese; but if cheese-makers will use too much starter, or starter that is going off in flavour, then it is the cheese-maker's fault, as a bad-flavoured starter should never be used on any consideration. With a starter with an acidity of ·88 (which is the desired acidity), 1 to 2 per cent. can be used with safety, and will prove of great benefit to the flavour. In preparing a starter, always select the best milk procurable. The first propagation should not be used; in fact, it is never safe to use until the fourth propagation, or until a sharp clean nutty flavour is obtained; and, if that desirable flavour is not obtained by then, it is just as well to throw it out and try another one. Once a good starter is procured—with care in selecting the milk, keeping the utensils which it comes in contact with during the preparation scrupulously clean, and keeping the starter in a clean, sweet atmosphere—it will keep for a considerable time. The beneficial points of a good starter are as follow:—

1. It is a cultivation of the germs which are so desirable in the manufacture of cheese.
2. By adding the starter to the milk in the early stages of the process of manufacture, it retards the growth of all other organisms of an undesirable nature which may have gained access to the milk.
3. By using it judiciously, and by the careful manipulation of the rennet test before setting, it regulates the working of the curd throughout the day.
4. In cold weather it assists in the ripening of the milk. It also hastens the development of the acidity after the whey has been drawn off during the cheddaring process.
5. It helps to impart to the cheese the nutty flavour so much desired by the consumer.

In preparing the starter, select good, clean milk, free from any feed flavour, and heat to a temperature of 200° Fahr., and cool quickly to a temperature of 75° Fahr., then add the culture kept from the previous day. Do not have the starter thick and curdy when it is required for use. When broken up it should run through a fine sieve without the least trouble. Always add the starter to the milk in the cheese-vat before the temperature has been raised to setting point, or it will have a tendency to float on top of the milk, and will not mix readily.

The pure culture to begin the starter with may be obtained from the Dairy Branch, Department of Agriculture.

The Rennet and Alkali Test.

It is necessary to use some test to ascertain the ripeness of the milk before setting. Some use the rennet test, and some the alkali test. Some even do

not take the trouble to use a test at all, depending simply on their sense of taste and smell. The latter is, however, a careless and indifferent method, and the rennet test is recommended, as much finer work can be done if the test is carefully manipulated; and in the careful use of the rennet test lies the secret of uniformity in any factory's output.

The Use of Racks in the Vat.

There is one thing I would like to draw the attention of cheese-makers to, and that is the use of racks in the vat in preference to the use of a drainer or cooler. Very few places that use the cooler have, as a rule, taps in the vat to whey off by, but draw off the whey by means of a syphon. Now, I have never yet seen a syphon that could be kept thoroughly clean, and every syphon that I have looked into had a thick yellow slime where the pipe is bent round. Then again, the drainer is made of wood, and the difficulty in keeping it clean is apparent, as every seam of the wood holds material for contamination, whilst the cloth that covers the curd in the cooler is resting on the curd, and in many cases it is not too clean. It would be much better to have a tap in the vat to draw off the whey, and a neat fitting rack to cheddar the curd on—one that can be taken out and placed in the wash-up tub and scrubbed; and also, have a white canvas covering attached to battens to cover the whole of the vat, and which would never at any time come in contact with the curd.

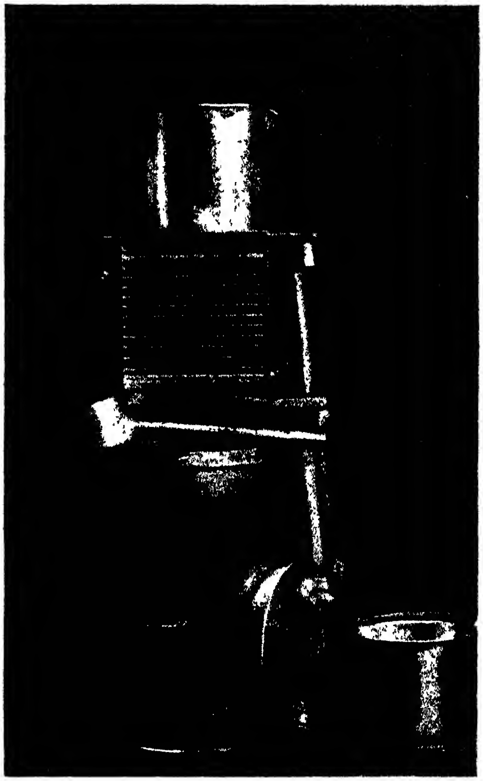


Fig. 4.—A small Cooler and Starter-can for preparing Starter.

The Technique of Cheddar Cheesemaking.

The night's milk and morning's milk are mixed together in the vat, and the temperature raised to 86° Fahr. to find out the ripeness of the milk. To see whether it is ready to add the rennet, we have two tests, the rennet test and the alkali test,—either of these are fairly reliable if carefully taken. In taking the rennet test you are not testing the strength of the rennet, but finding out how fast the lactic acid is developing in the milk.

The Rennet Test described.

Take 4 oz. of milk in a cup or glass, be sure the temperature is 86° Fahr., place a float in the milk, a piece of straw or a chip or wood, add one dram of rennet, and stir with a spoon for five seconds, then withdraw the spoon from the cup altogether, and note how many seconds the milk takes to coagulate,—when the straw ceases to twirl in the cup the milk has become thick. Take the number of seconds from when the rennet is added until the straw stops twirling. Now, for example, say we set at twenty seconds with the rennet test, and we found that the curd was slow in working (laid a long time before the whey was ready to draw), next day we would allow the milk to ripen a little more before setting,—that is, reduce the seconds on the rennet test from twenty to, say, sixteen; or, on the other hand, if the curd worked too fast, set sooner, say twenty-two seconds. Thus it is the rennet test that is a guide to the cheesemaker and regulates the work through the day, inasmuch as he knows—by careful manipulation of his test—he can set his milk at the proper time, which will enable him to have a good firm shotty curd when the whey is ready to draw off.

If making a coloured cheese, add the colouring before adding the rennet, in the quantity of a quarter of an oz. to an oz. to 1,000 lb. of milk, according to the shade of colour required. In setting the milk the quantity of rennet depends upon the strength of the rennet; sufficient rennet should be added to coagulate the milk to have it firm enough to cut in from thirty to forty-five minutes. The quantity as a rule is from 3½ to 4 oz. to 1,000 lb. of milk; dilute the rennet in a little clean cold water, and stir into the milk; the stirring should continue from three to four minutes to ensure it being properly mixed; the stirring should then cease and the milk allowed to set. If the cream shows a tendency to rise to the top, the surface could be agitated with the hand or a light piece of wood, but the moment coagulation shows signs of taking place, this should cease. After about 30 minutes has elapsed the curd should be tried to see if it is ready to cut. A good way to do this is to wet the finger and dip into the curd in a slanting direction, then on lifting it up if the curd breaks readily and clean off the finger it is sufficiently firm to cut with the curd-knife; avoid cutting too soon when the curd is soft; it should be allowed to remain a little longer until it becomes firm. If the knives are used before the curd is sufficiently firm a good deal of waste takes place, because the curd being in a soft condition gets broken up, resulting in the fine particles of curd floating away in the whey. Use the horizontal knife first longitudinally, or up and down the vat; do not hurry the operation, and be careful not to break the curd by pushing it in front of the knife; once with the horizontal knife is sufficient. Then use the perpendicular knife across the vat, and then up and down the vat. When the operation is complete the curd is cut into cubes of about three-eighths of an inch in diameter. If the milk should be working fast, necessitating the hurrying of the cooking of the curd, it will be found an advantage to cut the curd finer; a second application of the perpendicular knife will be found to be an advantage. After the curd has been cut with the curd-knives,

begin stirring with the hands; go round the sides of the vat and the bottom and remove any curd that may be adhering; do not allow it to settle to the bottom or form in the corners; the stirring should be continued until the curd has finished cooking. After stirring with the hands for a little while at first, the agitator or rake could then be used. The stirring should be gentle at first to allow the cubes time to firm a little. Then, as the cooking process proceeds, the stirring should be more vigorous; never allow the curd to run together in lumps, thus to ensure an even cooking right through the whole of the vat's contents. To handle the curd by stirring roughly in the first stages of cooking, when the curd is soft and tender, the loss in fat will be considerable. By careful cutting and careful stirring the loss is very small, the colour of the whey should be more or less clear, not showing the white milky colour, as is the case when through rough handling a good deal of waste has taken place. The object of cutting the curds into cubes is that it expels the whey freely and allows these particles to become firm and properly cooked. In cooking the curd, gradually raise the temperature from 86° to 98°, 2° in the first ten minutes and 2° in every five minutes afterwards; thus the time taken from when the heat is first applied until it is raised to the proper cooking temperature should be thirty-five minutes. The main object of cooking is the expulsion of whey from the curd, thus causing it to become firm and shotty. It is not advisable to raise the temperature too quickly, as then a skin forms on the outside of the cubes and the moisture is retained within; thus a gradual heating process is necessary, causing the whey to be expelled and the curd to become firm at the same time. If it is found when the temperature has been raised to 98° Fahr. that the curd is not firming up as well as could be wished, raise the temperature a couple of degrees higher, say, 100° or 102°; but never on any occasion is it advisable to raise it higher than 104° Fahr., as the risk of having a corky cheese is great, and a big percentage of the butter-fat is melted and lost in the whey. The time for wheying off should be from two and a half to three hours after the rennet has been added, not sooner than two and a half hours if possible, and not later than three hours. To have sufficient acid to draw the whey off before two and a half hours, the chances are that the curd is too soft, and the matured cheese will show a pastiness when rubbed between the fingers, denoting insufficient cooking, and will go off in flavour very quickly. If, on the other hand, the curd remains in the whey over three hours, the curd becomes too hard, and has a tendency to make a tough leathery cheese. The correct amount of acid at wheying off should be indicated by the hot-iron test, showing threads from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch. Draw the whey off through the gate or tap in the vat, lose no time in getting it off; in fact, be as quick as possible. This is a critical point at this stage of the manufacture, and too much acid given at this particular time will result in a dry, mealy, bleached, sour cheese. So the cheese-maker has to be alert. Drain the whey off as quickly as possible, and throw the curd on to wooden racks placed in the bottom of the vat and hand-stir until the curd becomes fairly dry, then throw it together to give it an opportunity to mat or form into a solid mass.

The vat should be covered with a clean cloth or canvas covering to keep the temperature even. It is essential that the temperature should be kept at about 90° or 92° Fahr., so that the production of lactic acid is not checked. If the temperature is allowed to fall, the development of acid is checked, and the curd takes a much longer time to form into a flaky substance. Fifteen minutes after the curd has been thrown together, it should be cut into square or oblong blocks, about 18 inches by 6 inches, and turned over, and allowed to remain for another period of ten or fifteen minutes. Then if the curd is firm the blocks could be piled two deep; but if the curd is soft, they should be left single and turned over. The object of this process is to eject the whey from the masses of curd. The process of turning every ten minutes should be continued, never allowing the whey to form in pools between the blocks else the colour is likely to become bleached or mottled in places. In the course of about two hours from the time the whey was drawn, the blocks of curd will have assumed a smooth soft velvety feeling, and when tried on the hot iron will draw fine threads about 2 inches long. The object of matting the curd is to improve the texture. Cheeses made from a well-cooked curd that has been properly matted, when they are marketable, will always show a nice waxy texture so different to the soft pastiness that is always found in a badly cooked and improperly cheddared cheese. The curd should now be milled and spread over the bottom of the vat.

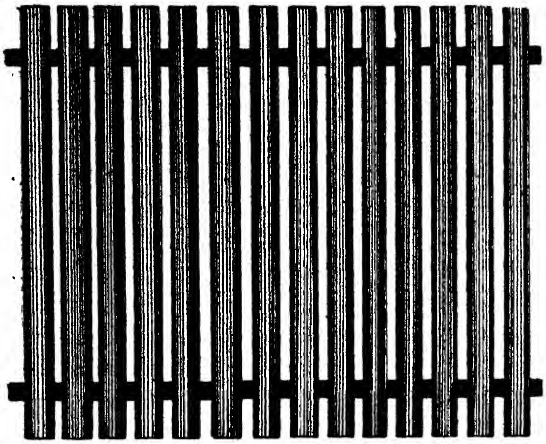


Fig 5. Curd Rack.

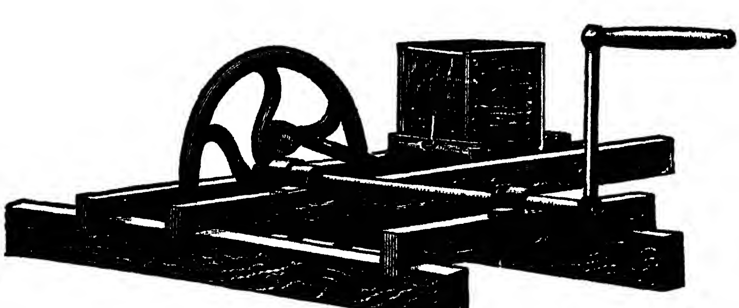


Fig. 6.—Curd Mill.

The object of milling is to cut up the curd so that the salt will be evenly distributed through the curd. Unfortunately there are a large number of

mills which cut the curd too small. The pieces of curd should be, after passing through the mill, about $\frac{1}{2}$ an inch in diameter. When the curd is cut too fine, too much moisture is drained from the curd when the salt is added, and the texture of the cheese is completely spoiled. After milling, the curd should be turned over gently at intervals of about three minutes, and should not be allowed to mat. This is called aërating the curd, the object being to allow any gas which may have accumulated to escape, and should be continued until the curd assumes a soft, silky, velvety feeling. The flavour of the curd can be very much improved at this stage by aërating longer, and the curd will develop that peculiar nutty flavour so characteristic in a good cheese. The salt should now be added, the amount is generally from $2\frac{1}{4}$ to $3\frac{1}{2}$ lb. per 1,000 lb. of milk. Of course, the quantity varies according to the thickness of the milk. Where

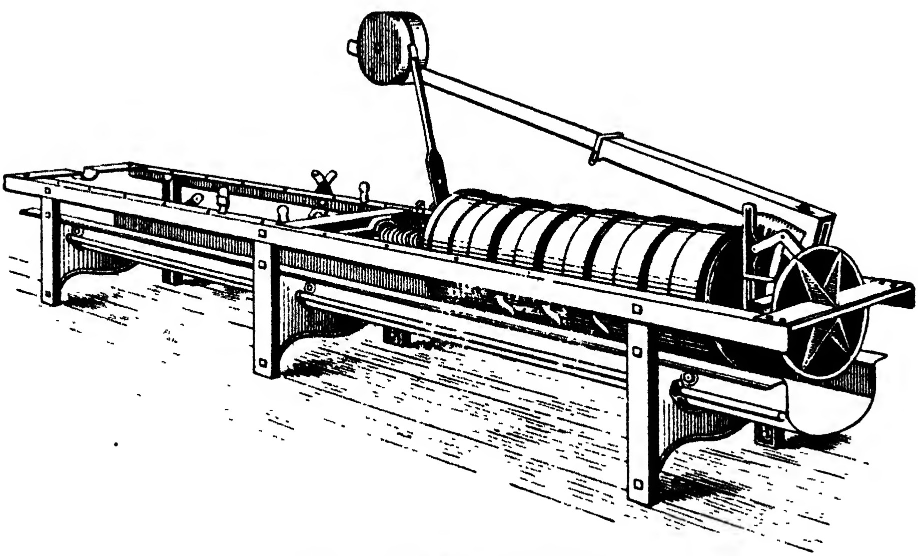


Fig. 7. - A Good Style of Cheese-press.

the milk is poor, the percentage of curd is less, necessitating the use of less salt. When the milk is rich, the percentage of curd is greater, thus requiring more salt. It is therefore necessary to adopt a sliding scale during the season. Starting in the spring of the year, when the milk is poor in butter-fat, with $2\frac{1}{4}$ lb. of salt, and gradually increasing the quantity as the season advances and the milk becomes richer. Of course there are occasions when a little extra salt will be an advantage. For instance, when the curd is soft and moist a little extra salt will assist in draining away a good deal of the extra moisture; or if the flavour is not good, a little extra salt will assist in retarding the effects of the bad flavour as the cheese ripens. The salt should be sprinkled over the curd and mixed thoroughly. Then three or four minutes should elapse, to allow the salt to dissolve, before putting to press. It will be found that the temperature will have fallen considerably from the time of wheying off until the period of salting. From 78° to 82° Fahr. is

about the proper temperature to press the curd at. Higher than 82° the fat is readily pressed out and lost. Lower than 78° the particles of curd will not adhere in a solid mass. When the temperature is too low—below 78°—the lactic acid has been unduly checked, and it is essential in obtaining a close-bodied cheese to have the proper amount of acid when the curd is put to press. When that is not present, the cheese is loose and full of holes; when cut or bored with the trier they show ragged openness right through. It is impossible to press a cheese close if the temperature has fallen too low and the amount of acid insufficient. When the bandage is put on the hoops the ends should be turned in about 2 inches at the bottom of the hoop, and a cap put in to cover the whole of the bottom of the hoop. The unstarched seamless bandage is preferable to any other, as it is difficult to get a proper rind on the cheese with the starched bandage; it should also be the proper width so that no wrinkles or laps will show on the finished cheese. The same amount of curd should be placed in each hoop so that each cheese will be of the same size, showing uniformity. When putting the cheese to press the pressure should be put on slowly at first and gradually increased. The cheese should remain for an hour, then they should be taken out of the press, the bandage pulled over the ends, the cheese turned and put back in the press. There they should remain with a good steady and continuous pressure on for at least twenty hours. When taken out after the twenty hours have elapsed, they should be wiped dry with a cloth and placed in the cheese-room. The cheese should be turned on the shelves every day so that the rind dries evenly and so that the moisture may not leak towards one end.

Cheese-curing Rooms.

Sufficient attention is not paid by cheese-makers on the South Coast to the cheese rooms, which in many places are without insulation, being simply weatherboard buildings, and some are not even lined inside. The loss that takes place through shrinkage must be great, not to say anything about the fat which is dripping from the shelves, in some cases, during the hot summer weather. The one great point in curing cheese is to prevent fluctuation in temperature, and the temperature should not rise above 65° Fahr. It is necessary to have the walls with at least 1 foot of insulation. Insulating paper, or malthoid, should be nailed on between the studs and the weatherboards, with a double row of studs inside, and paper, or malthoid, nailed between the studs and lining inside; the space between the weatherboards and lining should be filled with dry sawdust. The ceiling should be constructed on the same principle, with a ventilator that can be closed or opened going up through the roof, and, should the floor not be of concrete, it should be insulated also. The windows should be double and the doors close-fitting, and of the same thickness as the walls. A room built on these lines will be found to keep the temperature even, and, consequently, will prevent the loss and shrinkage already referred to, and repay in one season the additional outlay.

Cheese-packing in Crates.

The amount of handling that cheeses coming from the South Coast get in transit, and the condition they arrive in—after being rolled about the wharves and in the steamers' hold without any covering—as a rule, is anything but enticing to the eye of the consumer. Cheeses that arrive on the Sydney market from Victorian and Queensland factories are packed in crates, and present a clean and neat appearance. How much more inviting to the consumer would our cheese look if packed in crates, not to mention anything of the damage which would be prevented thereby as compared with present methods of shipping! It is nothing unusual to see piles of cheese standing four or five deep on the wharves or in the sheds, and in warm weather it often happens that the bottom row is squashed out of shape, and sometimes rendered unsaleable; in fact, it is indeed surprising that these indifferent methods should go on from year to year when a crate suitable for all requirements, to hold a hundredweight of cheese, can be obtained at a cost of about 10d. or 1s.

An Experiment with Lucerne and Pea Cultures.

During the latter part of last year, Mr. O. Halliger, Bective, near Tamworth, obtained from the Department of Agriculture a small quantity of Dr. Moore's nitrogen-fixing bacteria, prepared according to this gentleman's formula in the chemical laboratory of the Department by Mr. F. B. Guthrie. Writing to the Department, Mr. Halliger reports as follows:—"The garden peas I inoculated have done wonderfully well. Two patches were put in and grown under precisely similar conditions. Every plant of the inoculated peas grew, some to a height of 4 feet 6 inches, and bore plenty of sound, large pods. The roots were covered with well-developed nodules, and on some roots they were very large.

"Nearly two-thirds of the uninoculated plants died after being above ground for about fourteen days, the plants that did live were miserable and produced only a few small pods. The experiment with the Lucerne culture was a failure owing to excessive rain and floods." Further trials of this culture will be awaited with interest.

Mr. Keating, Public School, Bective, had an opportunity of visiting and inspecting Mr. Halliger's experiment plot and confirms the statement regarding the excess of growth on the inoculated over the uninoculated peas.

Hawkesbury Agricultural College and Experiment Farm.

Feeding of Pigs.

[Continued from page 642.]

H. W. POTTS.

X.

Cowpeas. Soy Beans. Velvet Beans.

With the exception of lucerne, we are unable in this climate to grow any permanent leguminous crop as a change of feed for pigs.

In mixed farming the value of cover crops in replacing the fallow is now being generally conceded. It is necessary to differentiate from those used as catch crops and for green manuring.

Cover crops check evaporation, prevent the soil baking, also the loss of plant-food by excessive rainfall in washing the soil or leaching, and they afford green, succulent food for stock.

Plants belonging to two groups are available for this purpose. The first are those known as the legumes, which possess the specific function of assimilating or storing nitrogen in the soil. They include clovers, cowpeas, Canada field peas, vetches, soy beans, velvet beans, lupins, and Beggar weed (*Desmodium tortuosum*). The second group are non-leguminous and embrace rye, wheat, barley, oats, buck-wheat, rape, and mustard.

The cowpea is looked upon as the most useful. It forms a succulent, relishable, nutritious forage for sheep, cattle, and pigs, during the hot summer months. At that period all other palatable fodders of high protein content are not available and the natural grasses and herbage are dry.

Cowpeas as a drought-resisting fodder stand unrivalled. They have been used in India and other notoriously dry countries for centuries.

They have acclimatised well here. The roots of the plant, like that of lucerne, penetrate deeply into the subsoils, in a vigorous fashion searching for plant-food and moisture, and at the same time opening up the subsoils and rendering them porous and available for the storage of moisture and air. The roots attack the stores of phosphoric acid and potash, dissolving them for their own use as well as for subsequent crops.

The characteristic nodules of legumes are found freely distributed along the roots, and in these the bacteria are engaged in assimilating atmospheric nitrogen and promoting nitrification; inert plant-food is made soluble and a source of root nourishment.

The roots and stubble are ploughed in with the excreta from the grazing animal. It is approximately estimated that the former alone give to each acre 24 lb. nitrogen, mostly gathered from the air, and return 6 lb. phosphoric acid, and 15 lb. potash, largely drawn from the subsoil, and in a

form readily assimilable by the next crop. The organic matter provides humus and increases the moisture-holding capacity of the soil. Whilst the plant is growing the thick rich spreading foliage covers the ground, arrests evaporation, stops the growth of weeds, and keeps the soil in a loose friable condition.

It is an ideal cleansing crop and pays its way in furnishing stock fodder, and in addition the soil is enriched with humus, nitrogen, potash and phosphoric acid, fertility is restored, and the land effectively manured for a main crop. In short, to use a familiar farmer's phrase, the land is brought into "good heart."

As a food for stock, particularly pigs, during the latter part of summer we have had abundant evidence of its flesh-producing capacity, and, as with lucerne, its power to provide a suitable intermixture of lean flesh in bacon and pork. Young pigs, 3 months' old, when building up frame and tissue, make excellent progress on cowpeas balanced with rye, wheat, barley, potatoes, or maize. The ration can be modified to suit the needs of the animal as it approaches the fattening stages. The foliage of the plant may be utilised for providing green forage, or allowed to ripen sufficiently for hay or silage, or the beans can be used as pig-feed. As a fodder, the yield per acre varies, and is determined by the variety grown, soil, cultivation, and climate. At this College quantity has ranged from 4 to 12 tons of green feed per acre. The composition will average as follows:—

Water	84 per cent.
Dry matter	16 „
	100

The dry matter contains:—

Fat	·4 per cent.
Protein	2·4 „
Carbohydrates	7·2 „
Mineral ash	1·6 „
Nutritive ratio	1 : 3·3.

It will be noted that it closely resembles lucerne in feeding value, and can be fed with equally good results. It contains nearly double the digestive nutrient of oats, and 40 per cent. more than maize. Tests have demonstrated that pigs fed on cowpeas, with maize, have produced a high-class bacon. Owing to changed soil conditions and environment the cowpea has varied from time to time, hence there are many sorts. Over thirty from America and India have been tested on this farm. Variation ranges between two distinct classes, one class being upright in growth, compact, bushy in habit, and without runners; the other producing long, trailing vines, or runners, and spreading well over the soil.

The first or bush varieties are noted for their heavy, quick growth, and succulence. Amongst these the following have proved most successful on this farm—Poona and Chinese Mottled. In hot dry districts, with a sparse rainfall, cowpeas take longer to mature. The best sorts are those of trailing or recumbent habit. They possess a deep root-growth and are better enabled to withstand drought. The sorts recommended are—Black, New Era, Clay, Whip-poor-Will, and White. It should be remembered that cowpeas readily alter their habits in response to local conditions of soil and moisture.

The seed-pods range in length from 4 to 16 inches. These, with the seeds, are of all sorts, shapes, and colours. Each sort varies in time of maturing, habit of growth, ripening, and other features. It is best to select tested varieties for the main crops and to conduct tests with new sorts on a small scale.

The most satisfactory variety subjected to a series of trials here for the past six years is Poona, an upright, bushy plant, of vigorous and dense growth. This was originally imported by the late Mr. Farrer, from the Department of Agriculture of India. We have had a yield as high as 10 tons to the acre from it. Cowpeas revel in heat and sunlight, and will thrive on a wide range of soils; generally they do best on light soils. The light sandy loams at this College have always afforded good returns from this plant. The only soil in which it will not respond is that which is constantly wet. In all cases the soil should be deep, well drained and mellow.

On impoverished soils the crop is one of the safest and most certain renovators. Being a hot climate plant it is necessarily very susceptible to frost, and planting should not commence until frosty weather has passed. November is usually the month to sow the main crop, although successful crops have often been secured from October sowings. Fresh sowings may be continued until February. The soil must be well cultivated and brought into a fine condition of tilth. Where manure is required, the best stimulant to rich growth can be secured from an application of fertilisers affording phosphoric acid and potash. This is supplied by the following:—

Superphosphate ... 200 lb. Muriate of potash ... 100 lb.

per acre spread broadcast. In some soils—clay loams—it is found essential to release plant-food by dressings of lime at the rate of ½ to 1 ton per acre.

The best practice is to sow the cowpeas in drills 2 ft. 6 in. apart, the seed 6 to 8 inches from each other, and covering with soil about 2 inches.

The use of a maize drill fitted with a plate having ⅜-inch holes facilitates sowing.

Cowpeas germinate quickly on moist, well-prepared soils. The whole crop grows rapidly and evenly. Shallow cultivation should be followed once a month with scuffler or cultivator until the plant is developed.

Of late years the practice of sowing climbing varieties of cowpeas with maize or sorghum has been adopted with very good returns. The yield per acre, in many instances, has been doubled. For conservation as silage this class of crop is becoming increasingly popular, especially the combination of maize with cowpeas, seeing the increase of protein by the latter assists to balance the food constituents.

In using the crops for hay the best time to cut is when the first pods begin to ripen. Like Red clover it is liable to heat if carted and stacked too early.

The cut hay should be left exposed to the sun for a few hours, and then put into cocks for thirty-six to forty-eight hours.

Care should be observed in drying not to allow the leaves to become brittle. If the hay be too moist when stacking it is likely to become mouldy. It should be carefully stacked and protected from the weather.

The following statement of the analyses of cowpea hay and lucerne hay shows their respective merits for stock feed :—

	Moisture.	Protein.	Fat.	Carbo-hydrates.	Ash.
	per cent.	per cent.	per cent.	per cent.	per cent.
Lucerne Hay ...	6·95	16·48	2·02	42·62	7·49
Cowpea Hay ...	10·29	19·72	4·04	45·15	9·10

Soy or Soja Bean.

This plant comes from Japan, and of late years has attracted attention as an annual leguminous plant which produces the richest of all beans in protein and fat. It closely resembles the cowpea, is of bush form, erect, hairy, branching freely and growing to a height of 2 to 5 feet.

The seed pods are clustered on the main stems and branches, are 1 to 2 inches long, and contain from one to three seeds or beans.

They give a greater yield of beans than cowpeas. They are not trailing in habit, hence are more easily harvested. They mature early, but last longer than cowpeas, and afford a longer season for pigs to feed on them. Either the green forage, hay, or beans should be associated with other foods owing to their richness. In feeding the bean it should not be more than one-fifth of the total ration. As high as 10 bushels of beans to the acre have been harvested here. These are classified as the richest of all natural vegetable foods, and should be used to strengthen the ration in protein. With their aid pigs can then be fed with potatoes, maize, barley, rye, or other starchy foods. As a green forage crop they are highly appreciated by pigs, and afford a more nutritious diet even than cowpeas. The plant can be converted into hay in a similar way to that of cowpeas.

As silage it has been found most successful when mixed with twice its weight of green maize.

The Soy bean requires a good loamy soil well drained, although like the cowpea it is adapted to a wide range of soils.

A deep, firm, well-tilled, moist seed-bed is required here. It should be ploughed to a good depth about the end of July or beginning of August and worked (harrowed and rolled) to a fine tilth. Should fertilisers be required, use that recommended for cowpeas. The seed should be sown when all chances of frost are over; as a rule the beginning of October is best when some warmth is in the soil.

Sow in drills 2 ft. 6 in. to 3 feet apart. One plant should be permitted to grow every 6 inches. From 8 to 10 lb. of seed per acre is needed. Shallow cultivation should follow until the plants are well grown. The quickly maturing plant and pods ripen in from seventy-five to ninety-five days. It is a good drought resister.

As a food for pigs, either as beans, green forage, or hay, it has a high reputation. The animals fatten quickly, are always thrifty, with strong appetites; the hair and skin acquire a glossy look, and the skin feels as if they were fed on oil meals.

Velvet Bean.

So far this leguminous plant has only been grown in an experimental way to test its capacity as a fodder, but sufficient data have been secured to warrant extended trials for its use as green summer forage, for green manuring, and as a cover crop.

Its leading drawback is that it requires a long summer for its proper development, as it is a native of India and thrives well in a hot, dry climate.

Both plant and bean are useful as fodder for stock, and pigs relish the food and provide good returns on it. It grows freely on light, sandy land, provided it is fairly well drained. When moisture is available with summer heat the plant produces enormous yields. Under ordinary conditions it will give a return above the weight of cowpeas per acre. The plant grows in a trailing state and produces vines running from 20 to 30 feet in length; they twine around any obstacle, and are often grown in conjunction with maize.

It is a heavy cropper and has been known under favourable conditions to produce 30 tons of green forage per acre. The seed may be sown in the warm districts in October. The roots go well down into the subsoil and necessarily require a deeply ploughed soil. The seed should be sown in drills 3 ft. 6 in. apart with a space of 1 foot between each. The best fertiliser is:—

Superphosphate	... ...	150 lb. per acre.
Sulphate of Potash	... ...	80 lb. ,,

Cultivation should be pursued as long as the plant growth will permit. Owing to the entangled nature of its growth it is difficult to cut for stall green feeding or hay. It is therefore best used as a grazing crop, and the pigs should be turned in to eat it off.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for August, 1908.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture (Saturation=100).			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	% of the year's Evaporation.
29·40 3	30·32 13	30 13	30·0 19	76·0 22	52·45	51·62	47 17	94 2, 6, 7	79	·211 4	2·776	2·231	6

Rainfall... { Points ... $\frac{35}{1}$ $\frac{84}{2}$ $\frac{46}{3}$ $\frac{92}{4}$ $\frac{8}{5}$ $\frac{31}{6}$ $\frac{54}{7}$ $\frac{15}{8}$ $\frac{8}{9}$ $\frac{2}{10}$ $\frac{9}{11}$ $\frac{58}{12}$ $\frac{22\frac{1}{2}}{23}$ $\frac{10\frac{1}{2}}{25}$ = 475 points.
{ Dates ...

Mean for 16 years, 212 points.

Wind ... $\frac{NE}{14}$ $\frac{S}{9}$ $\frac{SW}{5}$ $\frac{NW}{3}$

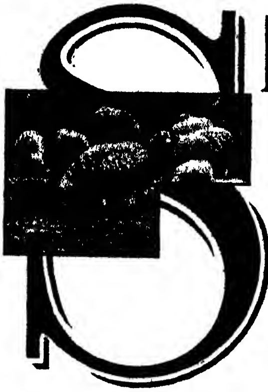
Thunderstorms on 10th and 11th.

Greatest daily range of temperature, 36·2° on 31st.

Frosts recorded on 16th, 19th, 21st, 24th, 26th, 27th, 28th, 29th.

The excellent rains recorded for the first half of this month have greatly improved the prospects of a successful spring.

W. MERVYN CARNE,
Observer.



Sheep for Farmers.

R. H. GENNYS,
Glen Innes Experiment Farm.

FARMERS who combine other industries, such as the growing of cereal crops, with sheep breeding should secure a flock that will give them the best net return annually per sheep.

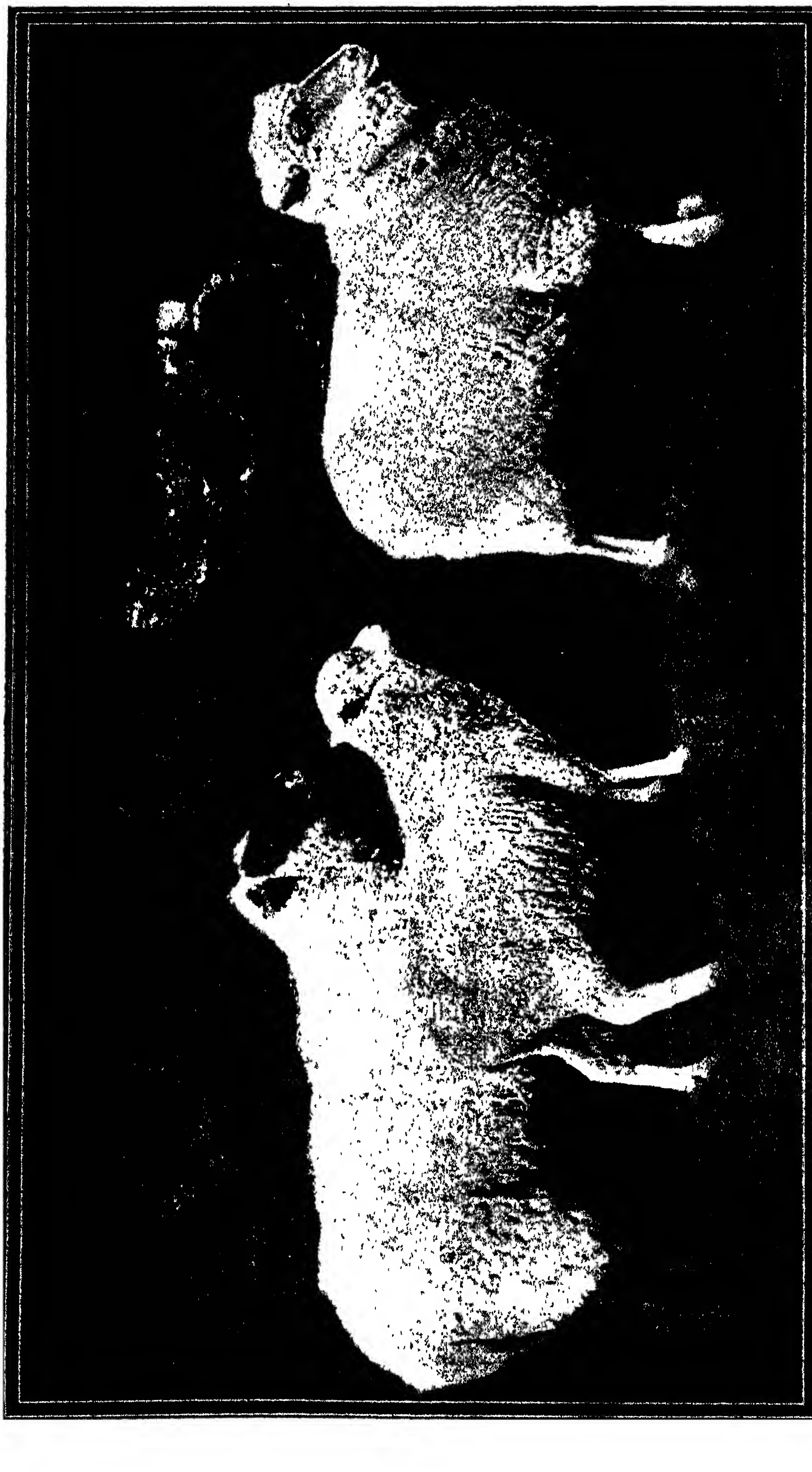
Having but very limited areas, as a rule, the increase must be got rid of quickly, so that early maturity is a very important feature, and lamb and teg mutton raising is chiefly aimed at; this is quite in agreement with the meat export trade, which always prefers the early maturing carcase.

Wool is a secondary consideration, but must not be overlooked in the mothers of the lambs, which may be shorn for several seasons.

What the lamb and mutton trade requires as well as early maturity is quality of meat more than quantity. The weights required in lambs being from 28 lb. to 40 lb. not more, anything beyond this is too heavy and would probably be termed teg or weaner mutton, for real lambs should be suckers up to the time of being slaughtered, and should be taken from their mothers at about 4 months old in order to give the latter time to properly recuperate before being mated again.

Rams to be used.—As the British breeds point to the earliest maturity they should be used principally as the sires of the lambs, and of whatever breed should always be a PURE-BRED of the best description and constitution, as he will then be likely to impress his qualities on his offspring. For lamb and mutton raising he should have the mutton points well developed, some important ones being:—Good shoulders and broad withers, deep, full chest and brisket, good girth measurement, wide back with well sprung ribs with good loins, broad dock and deep full twist; with the other male attributes that should be possessed by all sires—such as masculine heads, wide nostrils, good scrags, and wool of stronger type generally than ewes of the same breed.

The Ewes should possess a good carcase, but effeminate in character, with good digestive organs, well developed hind-quarters and good udders, obvious points necessary for producing a good supply of milk for the speedy development of the lambs. In all cases the ewes should be bred in the district or a similar one, so as to thrive well under all local conditions, as the way they thrive must in a great measure be reflected in their offspring. Young ewes should be bred from in preference to older sheep, but in a well-developed cross-bred should have two teeth up before being mated. In merinos generally it is advisable that the four-teeth should be up before breeding from them. When big-headed British rams are used with merino ewes, attention must be



(Left) Pure-bred Suffolk Ram (the sire). (Centre) Pure-bred Merino (the dam). (Right) Their progeny, a Suffolk-Merino Wether

given at lambing time to assist any ewes requiring aid, and in any case it pays to be very watchful of the flocks at this season, for the percentage of lambs may be increased considerably thereby.

Mating.—It is generally admitted that ewes in rapidly increasing condition, but not too fat, are likely to be most prolific. Under average conditions a ram should be mated with not more than sixty ewes; he should be in strong condition, but not too fat. If he should be very fat and lazy—when convenient, yard the sheep at night for a week or so.

Lambing.—The ewes should be in good condition, but not too fat. They should be on good pasture from the time of lambing until lambs are weaned or sold. The lambs must be well supplied with milk all the time or early maturity cannot result.

Lamb-marking, &c.—Lambs should be ear-marked, detailed, and castrated at from 10 to 20 days old, as they recover much quicker from operations than when older. The latest method is to sear off the tails with a red hot iron instead of cutting them off with a knife. The former method saves much loss of blood, and consequently little or no check is received from the operation. Lambs do not appear to sulk after searing as they do after cutting off the tails; the cut dries and heals quickly and is less likely (being drier) to be attacked by flies. If a disinfectant is used, such as Stockholm tar or a sheep dip, do not put it on the seared part, but smear it on the wool adjacent thereto. One of the objects of searing is to dry up the wound; that of tar, &c., to keep flies away by the smell near it. When searing make the iron very hot, but do not press too heavily. A moderate time in taking the tail off makes the operation more complete. The principal advantage in searing is claimed to be that it checks loss of blood and consequently prevents any check in development, which is such an important point. Castrate lambs with care and at an early age. Avoid frosty or very hot weather if possible. Be careful to use a clean knife. Do not use a knife for other purposes before thoroughly cleansing it. A clean wound in the scrotum heals quickly. Use Stockholm tar or other disinfectant on the cut. If any dirt is introduced on the blade suppuration may supervene, delay healing, and may check growth.

Percentage of Lambs.—Taking for example pure-bred merino ewes producing 75 per cent. of lambs, the average British ram on merino ewes would give about 5 per cent. more, or 80 per cent. The British ram on a crossbred (British ram on merino ewe) would be about 10 per cent. more, or 90 per cent., while several of the pure British breeds would go 100 to 130 per cent.

Food during rearing of Lambs.—It is most important that the ewes and lambs should have good feed continuously, that no check may occur which would more or less defeat the object of early maturity in lamb-raising. Something more than natural herbage is generally required. Good introduced grasses such as Perennial and Italian Rye, Prairie, Kentucky Blue, Timothy, and the like should be provided. Lucerne for spring and summer topping, and rape and Red clover for the winter and early spring are hard to beat. Care must be taken, however, in putting sheep or cattle with empty stomachs on the three latter fodder plants for the first time, or hoven may result. Neither should they be put on on windy and wet days at first. Get them

Pure-bred Lincoln Ram, age 22 months, showing staple of wool.

gradually accustomed to the change by putting them on with fairly full stomachs for a few hours a day; they will then be fairly safe. Lucerne, clover, and rape are all good preparations for wheat, and the droppings of the sheep provide valuable manures and greatly help to keep up the fertility of the land.

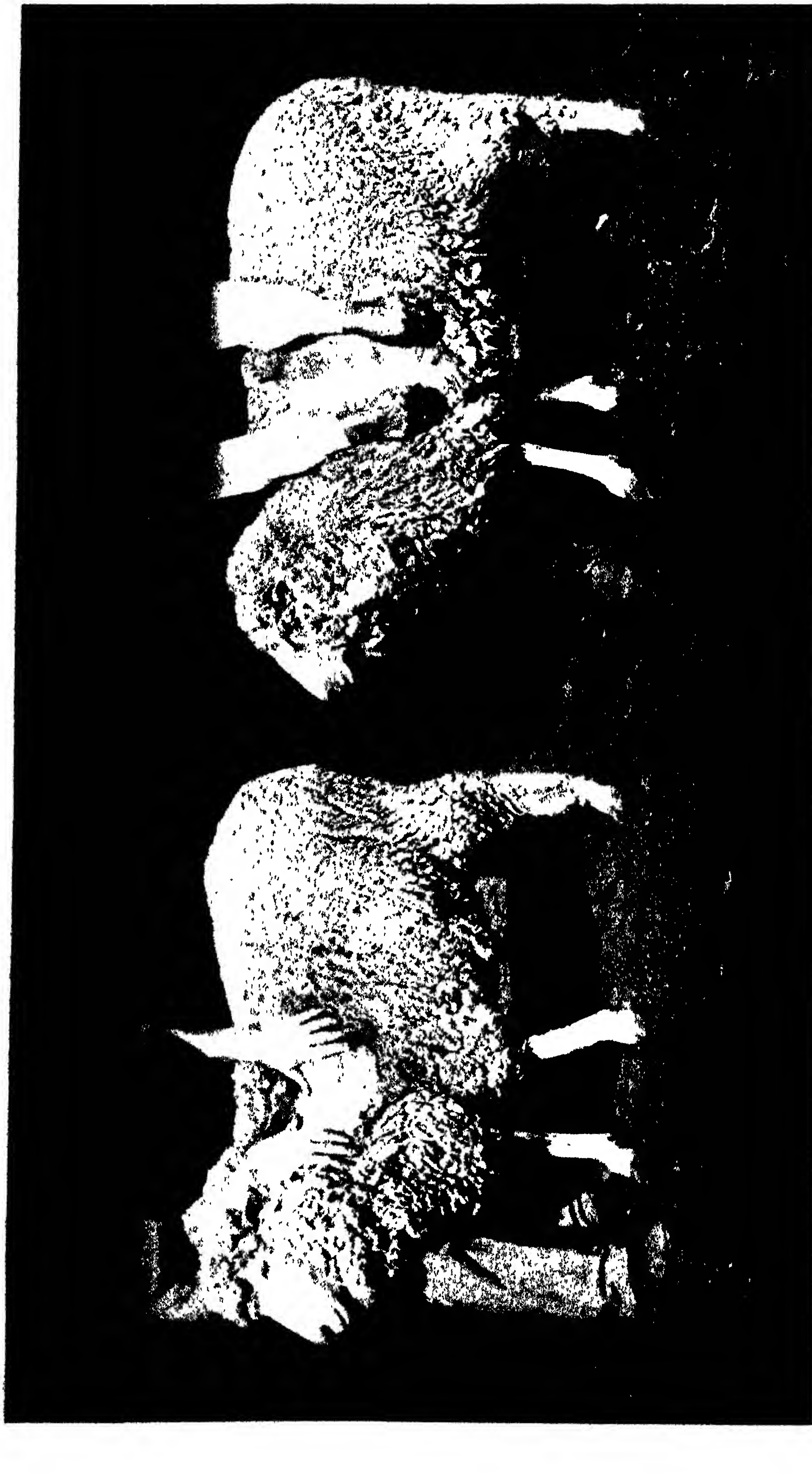
Rape is a capital crop for topping stock and improving the quality of the meat—it has been found that from 60 to 100 lb. of superphosphate will about double the yield of green fodder of rape, and much of the manure can be returned through ploughing in the later growth for the benefit of wheat, besides adding organic matter to the soil.

Cultivated Pastures.—Land that has been heavily stocked, no matter how rich at first, must become gradually depleted of phosphates on account of stock, and especially young stock, appropriating so much in the composition of their carcases, which is not returned again to the land in their manure. The phosphates, then, must be returned to the pastures by top dressings occasionally with phosphatic manures if their fertility is to be kept up. The clovers which may be sown with all pastures will probably keep the land well supplied with nitrogen. Burning pastures, as a rule, is to be discouraged, as this gradually depletes the soil of organic matter, and makes the grasses sour; the sweeter and shallower rooted grasses will also have their roots destroyed, and the grass seeds that would have renewed them will be lost; it will also be found in wheat paddocks that continuous burning of stubble will gradually lessen the nitrogenous contents. Stocking heavily for rank, sour grasses is preferable to burning off.

Change of food is very valuable to ewes and lambs, and keeps them in health. The point is to keep them improving from their birth until they are weaned, for then both the weight and the quality will be there at an early age. For stock grazing on succulent growths, like rape, lucerne, turnips, &c., access to a convenient paddock with dry grasses is advisable. The drier foods help to make a better balanced ration, and to a great extent helps to prevent hoven and scours.

In New England a farmer must not depend on the natural grasses, for while they put on flesh for a few months in the year, they are really at no time fattening, and are certainly not succulent enough for young lambs. Introduced grasses and fodder plants must be provided. On this farm pastures of lucerne, cocksfoot, Perennial rye, Red clover, Kentucky Blue grass, and Timothy, have given encouraging results during the first few years, and all merit longer trial in the hope of getting a good mixture of pasture grasses for New England soils. A small patch of Phalaris commutata also promises well, but it is too early yet to say how it will stand close feeding.

Lambs must be young and prime to fetch good prices, and be fit for freezers. Merino lambs and wethers do not make good sheep for oversea; they have neither the shape nor the colour liked, and, as a rule, they mature but slowly. The British-Merino half-breds generally have mutton of very good quality—probably the best liked of all—but it is the experience here that those that have the largest proportion of British blood attain the weights required much earlier. These might be termed second crosses, and the mothers of them—to pay the farmer best as he shears them—should be of the long-woolled breeds;



Lincoln-Merino Wethers.

the Lincoln-Merino so far has proved the best wool cutter of all that have been tried here, with the Romney Marsh and Suffolk Down close together next; both the Border Leicester and English Leicester are shaping well in the wool line, but have not been tried long enough here for comparisons. The point is, the breeding ewes should have their wool taken into consideration, but not at the expense altogether of their carcases.

Weight of Lambs at Four Months Old.

The Suffolk-Merino in the first crosses over four years trials are, on the average, the heaviest, with the Romney-Merino second.

In the second crosses, so far, the Romney x Suffolk-Merino and the Shropshire x Lincoln-Merino are very close together ; on the average the Romney x Suffolk-Merino are the heavier. Neither of the crosses, however, in shape and quality are comparable with the Southdown x Lincoln-Merino or the Border Leicester x Suffolk-Merino. The latter have such splendid backs and well sprung ribs; the former Southdown x Lincoln-Merino are chubby, short-legged, and compact—a butcher's lamb all over ; but the weights are not as good at the age as the cross mentioned before them.

Now, all the breeds are good when suitably mated and able to adapt themselves to their environments. What does best generally pays best, and each will probably have a place in the varied climatic and soil conditions of our State.

The mutton and lamb trade is a most important one, and the farmer must consider what the trade wants ; and it is evident it is not the pure merino, and the latter is not the small farmers' nor the lamb-raisers' sheep. Why? The cross-bred lamb for freezing is worth about 1d. per lb. more than merino lamb ; the pelts of crossbred are worth fully twice as much, and the wool at auction in many cases fetches as much as merino.

Some people think that lamb and mutton, no matter how well chilled or frozen, cannot compete against home-killed meat in England. Well, if the report of an eminent authority, Mr. Samuel Rideal, is to be believed, this conception is clearly erroneous. The report is as follows:—

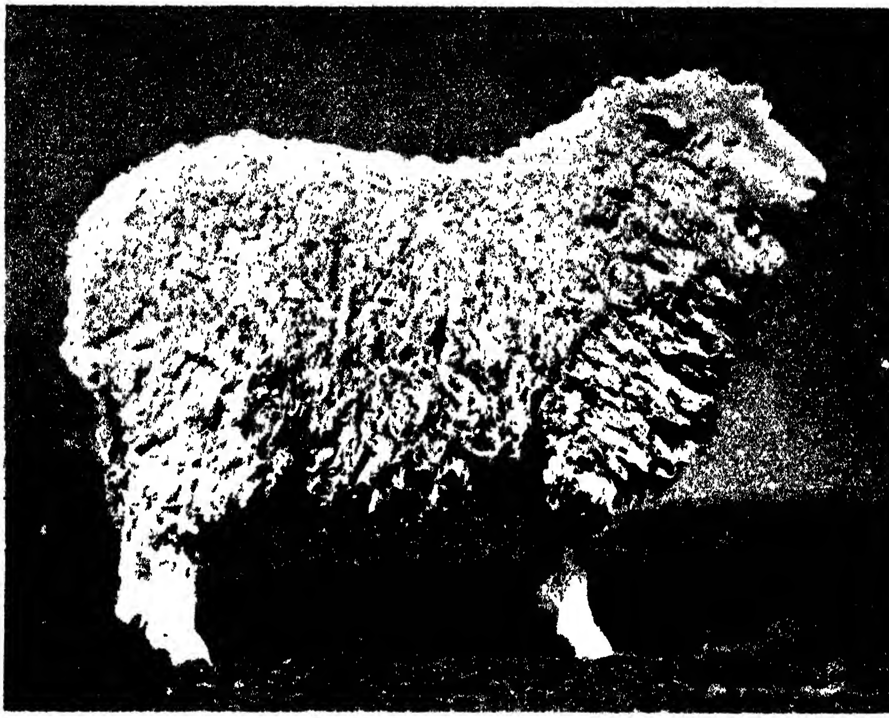
II.—Lamb and Mutton.

The second part of this inquiry deals with the relative value of hard-frozen Australian lamb and mutton as against home-killed meat. For this purpose Welsh lamb and English mutton were bought at Smithfield market on the 1st January, 1907, and compared with Australian lamb killed early in October, 1906, and with Australian mutton also killed about the same time, but shipped by a different steamer. The particulars of these four joints are as follows :—

G.—A leg of prime young Welsh lamb, being a cross between the Welsh and Radnor strains, weighing about 5 lb., brought to Smithfield market for sale on 1st January, 1907.

H.—One leg of prime Australian frozen lamb, of the well-known "Champion" brand, weighing about 5½ lb. It was shipped by the "Tropic," which steamer arrived in London on the 18th December, after a voyage occupying about fifty-two days, during which the meat was kept at a temperature of about 20° Fahr. The lamb had subsequently been kept in the Victoria Dock Store, at a temperature of about 16° Fahr. The tab attached to the leg indicated that the lamb was of grade 4 (*i.e.*, weighing between 42 and 50 lb.), and certified that the carcase was perfectly sound, free from disease, and suitable for human consumption. The lamb was loaded on steamer on October 27th, 1906, and was killed probably about a fortnight or three weeks prior to that date.

Lincoln Suffolk-Merino and Suffolk-Merino Hoggetts.



Pure-bred Romney-Marsh Ram.

J.—One leg of English mutton of the Leicester breed, bred and fattened at Taunton and offered for sale on the Smithfield market on 1st January, 1907. The sample leg weighed about 9 lb., and was fully representative of the characteristics of the Leicester strain.

K.—One leg of Australian frozen mutton of the well-known "Champion" brand. It was shipped by the "Runic," which arrived in London on the 24th December, the duration of the voyage, temperature, &c., in the case of sample H applying also to sample K. The Australian leg of mutton also weighed about 9 lb. It bore a tab, indicating that the mutton was of grade 65 (*i.e.*, between 60 and 65 lb.), and including a certificate similar to that on sample H. The mutton was killed about the middle of October, and was put on board steamer on 5th November.

It has frequently been alleged in the past that frozen meat is more wasteful than English, that it diminishes in weight more in proportion during the cooking process, has more refuse parts, which cannot be consumed, and less dripping and gravy. These objections have been refuted from time to time, and were specially reported on in the "Hospital" in 1896, dealing with New Zealand mutton. Since that date no further tests have been brought to notice. I, therefore, according to your instructions, repeated these baking tests with the above legs of Australian lamb and mutton, and followed the detailed methods of baking in every particular as in the former trials. My results are as follow:—

	G Welsh Lamb.		H Australian Lamb.		J English Mutton.		K Australian Mutton.	
	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
Weight when delivered	4	15	5	7½	8	10	8	9
Weight when taken from oven ...	4	2½	4	15	6	13½	6	7¼
Weight of slices suitable for hospital diet.	2	13½	3	8¾	4	4½	4	6
Weight of bone and waste	1	0½	1	1½	2	4	1	11
Pure bone	0	9	0	8¾	1	2	0	13
Dripping	0	4¾	0	4¾	0	11¾	1	0½
Gravy in dish after carving	0	1½	0	2	0	0¾	0	3½
Gravy under dripping	0	0½	0	0¼	0	0¼	0	0½

Romney Marsh sheep feeding beneath bananas.
This breed is very suitable for the coast and makes an excellent farmer's sheep.

WOOL.

Getting up of small wool clips.—Many farmers are losing up to a penny a pound in their wool by not paying sufficient attention in preparing it for market. There are cases where it might just as well be put into a bale with a pitchfork and trodden down. Practically everything goes in together—fleece, bellies, locks, dags, short and long staple, fine and coarse, merino and crossbred. Now what can a buyer make out of this? How can he tell the proportions of each in a bale? The consequence is a low value all round can only be risked and many will not bid for it at all.

It is not advocated to make too many sorts of a small clip, but it always pays to keep your fleece wool by itself and also to skirt off any stained or injured parts. If the wool is a good length, which it generally is in farmer's crossbreds, make two classes of it—first combing, which should be the majority of the fleece and of course the finer portion, then all the coarser portion should go into second combing, but there is no hard-and-fast rule and judgment must be used; but make the two sorts as even as possible in each, that is the point, and any fleece that is not fit for either should be cast out and put into a bale or bag by itself. Do not make an uneven lot for the sake of any fleeces.

Dirty and matted fleeces must always come out; tender staple should never be put with strong.

The *bellies* should always be kept by themselves, and it is better to remove the stained parts from those of wethers.

Pieces.—Where the clip is of moderate size it is always best to make the pieces into "firsts" and "seconds," keeping the large and bulky ones for firsts, the remainder being the smaller and the dirtier portions for seconds. The *locks* should be always put by themselves.

Now in a farmer's clip there may be some very small lots, say of bellies or locks, but they can be put into bags and kept separate, and it will pay to do it; all that is required is a little common-sense and trouble.

Sew everything up neatly and brand bales or bags legibly in more than one place with stencil ink, with a letter to signify sex as well as sort of wool within.

Shearing.—During shearing, if possible, do not keep sheep long without feed, as if cold or wet supervenes many may die.

Dipping for Ticks, etc.—Do not attempt to dip in very cold weather or if it is likely to rain. Many sheep have been lost after dipping in heavy rains, though it was summer time. Putting them through when overheated is also bad. In the early morning with the promise of a fine day ahead is the best time, so that they can get warmed up and feed before night.

Sheep in mixed farming operations are very valuable and keep up the fertility of soils in a cheap way.

They are a valuable source of income both from the sale of the wool and excess of sheep. They provide meat for home use as well as lambs for market. They eat off weeds, tread in stubble, and manure the cultivation land; also eat off rank growths, when advisable, to the great benefit of themselves.

As before stated the merino is not the small farmer's sheep but the large grazier's. The merino is a wool sheep and the very best. The mutton sheep is the crossbred, with a dash of the merino for wool improvement—this is the farmers' sheep. True crossbreds try fences more severely than merinos. But why have bad open fences? Good ones are a heavy first cost, but they last a great many years and return good interest all the time and save worry and annoyance to the owner and his neighbours.

It must be impressed on breeders that quality in lamb and mutton must be paid attention to, to obtain best prices.

The question of the meat export trade is of great importance to this State, and one that is capable of attaining vast dimensions, if what is required is produced and improved methods are carried out.

Advantages and Disadvantages of Crosses.

Lincoln-Merino Cross.—The Lincoln has proved an excellent sheep for crossing with the merino. The wool on the crossbred is excellent; its weight, length of staple and lustre giving it great value. It is unlikely that any crossbred will surpass it. The mutton, somewhat coarse and tallowy in the Lincoln, is improved in the cross with the merino. The shape of carcase when slaughtered is not all that can be desired, though generally weighty. They are not exempt from fluke or foot-rot.

English Leicester-Merino Cross.—The pure bred English Leicester is one of the oldest breeds, and has been used with great effect in the improvement of several other breeds. The cross with the merino is much fancied. They require abundance of succulent feed. Rough pastures would not suit them. They possess a shapely carcase, with mutton of very good colour, with a fleece of fair weight and fine lustrous wool. They are not exempt from fluke nor foot-rot. Their small fine heads are an advantage when crossing with merino ewes, and there are few deaths in consequence during parturition.

Border Leicester-Merino Cross.—The pure Border Leicester is a bigger and heavier sheep as a rule than the English Leicester—more leggy with a lighter middle piece, which indicates that the proportion of offal to dressed carcase will be light. They have a good carriage, are active and hardy, being

able to thrive much better than the English Leicesters on rough or scant pastures. Their heads are long and narrow, nose aquiline. The sharp protuberances of the eye-caps are apt to do damage to the uterus in lambing. The wool in the cross is of good length and quality, though rather light. Lambs in the cross mature quickly, have good backs, and generally of very desirable shape. They are likely to take a prominent place in lamb-breeding.

Romney Marsh-Merino Cross.—The pure Romney is a large heavy sheep with wool of demi-lustre which, when crossed with a fairly fine yolky merino, produces a wool of much value ; also makes a fine heavy wether at an early age and produces good marketable lambs in the cross with the merino ; but they are rather lacking in the shape desired by the trade. No country except the desert should be without the Romney Marsh, for it thrives where others cannot do well, viz., in the low swampy, coastal regions, as well as in poor hilly country where fluke and foot-rot abound. The constitution that enables this breed to resist these terrible scourges will make the Romney breed desirable wherever these diseases are found. Like other sheep, however, they suffer from worms.

Shropshire-Merino Cross.—The Shropshire is a mutton sheep well-known to fat-lamb raisers. As a shapely sheep with good mutton and early maturing qualities he is to be reckoned with. The wool of the pure-bred is much improved by crossing with the merino. The rams if allowed to get too fat are very lazy and slow at mating time, and a good deal of difficulty is experienced with the ewes—especially merinos when crossed with them—as their heads are large. The Shropshire belongs to the Downs or black-faced breeds.

Southdown-Merino Cross.—The Southdown is a true mutton sheep, not so heavy as the Shropshire or Suffolk. but a better shape in the hind parts than either ; it is unsurpassed for the quality and flavour of its mutton ; the cross with the merino is compact and shapely, though small, and much sought after by butchers. The wool of the pure-bred is somewhat harsh, short, and fleece is light, but becomes softer and better when crossed with the merino. The breed is hardy and sprightly, but not exempt from foot rot. The head is small, and the progeny of the cross with the merino gives little trouble during parturition.

Suffolk-Merino Cross.—Last, but perhaps by no means least, is the Suffolk sheep for crossing. The lambs from this cross are amongst the heaviest of all the half-breds. The Suffolk is not a handsome sheep, neither does the quality of the mutton come near the Southdown, but it does weigh. The wethers from this cross also attain a great weight and size.

The fleece of the pure-bred is of fair quality only, but in the cross with a fairly fine merino the improvement is wonderful, and experts pronounce it to be one of the best of the Downs half-bred wools yet produced. The Suffolk (pure) is a big, long sheep, with large black bare head and legs. The mutton is fair, fat and lean being well mixed. The ewes are prolific and good milkers, therefore first-rate mothers.

Comebacks, if bred judiciously, are useful sheep for either mutton or wool, according to the purpose for which they are required.

A Plea for Silage in the West.

C. C. BRADLY,
Mungeribar, Narromine.

ONE of the greatest difficulties against which this State has to contend, in her efforts to obtain for her products a favourable footing in the world's markets, is her inability to maintain a regular and continuous supply.

Just as we have struggled into a position to command attention, a disastrous drought will decimate flocks and herds, supplies will shorten, export becomes out of the question, and in severe visitations our stock become so reduced that a considerable time elapses before we are again in a position to compete

Crop of Sorghum being cut for Silage.

for the favour of foreign markets. In the meantime, of course, our rivals have been making the best use of their time, and we find ourselves shouldered out. It is indeed most unfortunate that a country like ours, in many respects the most favoured on earth, whose pastures are of such superlative excellence, and whose climate so mild, that over vast stretches stock may be depastured at large and brought to the pink of condition throughout the whole year, should be subject to these disastrous visitations. However, we cannot alter the natural conditions of the land, and in the natural order of things it is quite apparent that we shall always be more or less subject to droughts. It behoves us then to cast about for a practical method of mitigating their direful influence. Modern methods and practices suggest in the first place two palliatives: Irrigation, and conservation of fodder in good times to tide us over the bad. Irrigation as yet we know practically nothing of, except

experimentally, and what little we do k... al experience is not too reassuring; however, that is probabl... to our lack of experience, and without doubt, much will yet be ... w from loc... ...gation in localities where it is possible to procure or conserve th... e in part... water, still there will always remain huge tracts where irrigation ...e by irri... be practicable. In these parts much may be done without irrigati... ...ssary ...producing and storing sufficient quantities of fodder in the good yea... ...ver ...or there are really few parts of the State where this may not be done in ... normal time.

Much has been written of the unw...dom of allowing the luxuriant growth of grass and herbage to go to wast... in a good season when stock are quite unable to keep it down, and men w..., for the most part, spend their lives in an office chair, read a few miscellaneous agricultural publications, and acquire their knowledge of the country by travelling through it in a mail-train, abuse the poor landholder, who has sp... a lifetime in learning his business, for not cutting this superfluous growth and converting it into hay or silage.

These men do not know the difficulty, expense, and disastrous results to the pasture of doing what they advise. We know a number of men who have cut large quantities of grass hay and stacked it, but they have never persisted in the practice, in this section of the State at all events. Experience points to the fact that in almost all cases it will be found far more economical and profitable to cultivate fodder crops suitable to the district on prepared land, and cut and handle them in the regular way.

Hay is better than nothing, but silage is better than hay for most purposes where breeding stock are concerned. Ewes will rear good lambs and the lambs will afterwards do well on silage, whereas dry hay is practically useless in such a case. The influence that a good reserve supply of succulent fodder in the form of silage exerts on the management of a holding is far reaching. Not only is this influence felt in absolute drought, but the knowledge that the supply is there to be called upon if necessary, will affect all the methods, the stocking, the class of stock carried, etc.

The tendency at present is towards smaller holdings, and in these dry districts where large runs have been the order of the day, the small man, with 2,000 to 3,000 acres, is slowly but surely taking possession. This is the man to whom silage is going to prove an immense boon, and it needs no great foresight to predict that in the next few years almost all of these men will be insuring themselves against loss in this way. The tendency is in that direction. The prejudice and doubt as to its value are disappearing, and everywhere one hears inquiries as to the results obtained and methods employed by those who have pioneered the practice.

One of the greatest sources of revenue to the small holder is going to be fat-lamb raising for the export market, and with our capricious rainfall one never knows whether he is going to have sufficient succulent feed to lamb his ewes on—often indications are so bad that he is afraid to join the rams at all. Such has been the case to some extent in this and other districts during the present season, a great shortage in the lambing is the result, and in many instances where the rams were put in a high mortality both at and after

lambing has followed. This is not the only aspect of the case, for to make a decent living from holdings of this class it is necessary to stock up to the full carrying capacity of the land, and when the rains fail, if only for a comparatively short time, the stock has to be reduced to such a degree that they will not return anything like a sufficient income. Furthermore, the owner has usually to quit at whatever his stock will bring, and when the rains come stock up again, at a comparatively high figure. It will be readily seen how a sufficient standby of silage will change this—even matters up—and give one confidence in his operations. The idea of the expense of installing the necessary conveniences prevents many from embarking on the undertaking, but this need not be at all heavy.

Probably what has kept silage from coming into more general use is the notion, rather prevalent among farmers, that it requires a great amount of

Fibro-cement Silo.
Capacity 110 tons, being filled by means of a cutter and blower driven by a 10 h p. steam engine.

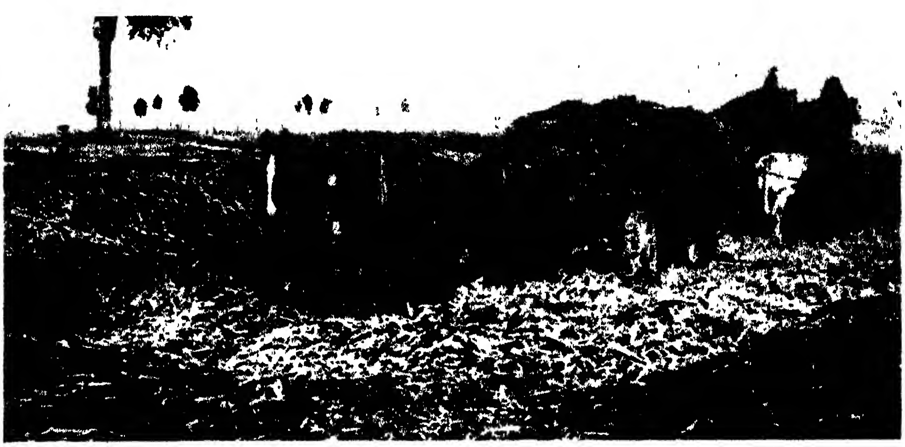
skill and experience to ensure success. This is not the case at all, for experience points to the fact that so long as the crop is cut at the right stage and put together with ordinary care, be it in stack, pit, or over-ground silo—chaffed or unchaffed—success must result, the amount of waste being inversely proportionate to the amount of care exercised.

It is quite natural that being a new thing to most, and having heard reports of failures, farmers have in the past hesitated in risking their crops by attempting to ensilage them, but now with silos scattered all over the country, in every district, it is so easy for them to see for themselves. As to the merits of any particular method, opinions are varied. Each, doubtless, has something to recommend it, and only a man's particular conditions and requirements can determine for him the most suitable plan.

There is no question but that a modern above-ground tub silo of substantial construction is the least wasteful; and where, from the nature of a man's

operations, as dairying, it will be kept in constant use, this plan will probably prove most suitable. On the other hand, in the case of the average stock farmer, where the supply is simply held as a reserve in case of drought, and may only be drawn upon perhaps once in five years, we hold the opinion that the simpler, if somewhat more rough and wasteful, method of pitting will be found most economical. This is our experience. Stacking we do not approve of except where facilities for making a pit are not to hand. It is much more wasteful and more costly in the handling.

One of the cheapest forms of silo now in use is the fibro-cement style. With our own labour and cutting our own timber on the place, we erected a 110-ton silo of this class at a cost of £55 2s. 6d.; a No. 13 Ohio cutter and blower requiring 10-h.p. to drive it, cost a further £42; and we can grow, harvest, and fill into it an average crop of sorghum or maize at a cost of 4s. 6d. per ton, including interest on the plant employed exclusive of the silo



Filling a Pit Silo.

A pair of bullocks may be seen on the extreme right of the illustration pulling the load off; the team and waggon pass over the sorghum already in the pit, which assists to consolidate the silage.

itself. Whether these silos will stand the test of time we cannot say. The other method adopted here is the ordinary scooped pit, and we incline to the opinion that this will prove the most economical method for the majority of stock farmers.

A convenient size for ordinary needs is 100 ft. x 25 ft. x 10 ft. deep, ends battered to 3 in 1. It can readily be put down with ordinary tank plough and scoops, the sides being trimmed down as straight as the character of the soil will allow, with a pick. The capacity will be 390 cubic yards, at 6d. per yard will cost a fraction over £9, will last for many years, and hold about 200 tons of made silage to the level of the ground. Pits, however, should always be heaped up another 4 or 5 feet and rounded off so as to ensure the silage being well above the ground level after it has settled. We can fill this class of silo without chaffing at a cost of 2s. 9d. per ton, including cost of growing crop, &c., as before; chaffed it will cost the same as the tub silo. The cost of emptying differs but little in either case.

Where sheep are to be fed it will probably always pay to chaff the coarse growing crops, as the waste in feeding is much greater with the long stuff.

The pit should be filled well up above the surface of the ground and allowed to settle for a few days, then a little old straw spread on the top if convenient, and about 18 inches of earth scooped back on top; it can stay there—let us hope for years—until required, and will open up good and succulent.

Particularly in Barley grass country there is usually a grassy strip round the edge of the wheat crops that is cut in cutting the firebreaks and roads. Many farmers keep this grassy hay for their own use, either because it is unmarketable or because they strip the rest of the crop for grain. The result is invariably trouble during next ploughing season from the grass seed getting into the horses' mouths and jaws and preventing them from doing well. It is false economy to use this stuff for chaff, much better to burn it, so why not scoop a pit and turn it into silage; it is an experiment that will cost little and I am sure will not be regretted.

NOTE ON *Argemone mexicana.*

J. H. MAIDEN.

[Previous references,—1891, Jan., p. 32; Mar., p. 125; Apr., p. 175; 1895, Mar., p. 157; Apr., p. 227; 1897, Jan, p. 3; 1899, June, p. 490; 1901, June, p. 643.]

This weed known as "Blue Thistle," "Yellow Poppy," "Mexican Poppy," "Devil's Fig," "White Thistle," "Binniguy Thistle," "Prickly Poppy," is widely looked upon in New South Wales as one of the few weeds without any redeeming feature.

In the *Cape of Good Hope Agric. Journ.* (April, 1908, p. 493) the following statement appeared:—

Mr. Bergh (Modder River) moved:—"That Congress [Farmers' Congress, 1908] recommends to Government the necessity for removing from the list of noxious weeds the plant commonly called Mexican Poppy." Seconded by Mr. Haarhoff.

Mr. P. Nel (Beaufort West) moved, as an amendment:—"That the Government be informed of the diversity of opinion between farmers as to the value or otherwise of the Mexican Poppy as a fodder plant, and that they be requested to appoint experts to make immediate investigation."

On a vote being taken, the amendment was negatived, and the motion agreed to."

On inquiry of the Under Secretary for Agriculture at Capetown, the following information was elicited:—

With reference to your letter of the 15th May last, relative to the above subject, I am directed to inform you that the principal reason advanced by those wishing to have Mexican Poppy (*Argemone mexicana*) withdrawn from the list of noxious plants is that in their opinion it is not only not injurious to, but will even, in certain seasons, serve as food for stock. This statement it will be noted is not an official one by the Department, but emanates from the farmers themselves.

Now I want to give even Blue Thistle its due, and if any one will show cause why this weed should not be exterminated I shall be very glad to hear it. I particularly desire evidence that stock eat it, not an odd nibble, but use it as food.

Indian Cane (*Saccharum officinarum*) as a Fodder for Dairy Cattle.

A. H. HAYWOOD,
Belindigarbar Experiment Farm, Grafton.

THIS cane was probably first introduced to the Clarence by the Sugar Refining Company. Owing to its peculiar characteristics it has not been grown for sugar production, but it has been grown for fodder for some years by several river farmers who testify to its value.

Indian Cane (*Saccharum officinarum*).

Its merits as a fodder do not appear to be known generally. In recommending cane to dairymen it must not be inferred that it is as nutritious or as desirable for the production of milk as some other fodders; its greatest qualification is that it is available all the year round and provides green succulent food at times when other feed is scarce. Statements have been made that cane when fed to cows lowers the fat percentage of the milk. The writer's experience, extending over two years, with daily tests by the Babcock test of milk produced by cows fed mainly on cane, is that the test is not affected any more than it is when feeding exclusively on any other single food, in which case the health of the animal eventually suffers and the test is thereby lowered. Furthermore, feeding tests conducted at the Wollongbar Experiment Farm demonstrated that a ration of cane and bran was eaten by cows with greater relish and gave equal results in milk yield and test as when fed on a ration of maize, silage, and bran.

Description of Indian Cane.

The plant grows to a height of 12 feet to 15 feet; the stems are pale yellow, tender, about the thickness of sorghum, the rind is not so woody or indigestible as the ordinary sugar-cane; the base of the leaves is devoid of the minute prickles found on some varieties of cane, such a variety for instance as No. 14, which is injurious to stock when much used.

Some cuttings of Indian Cane were planted on this farm on 3rd December, 1907, 5 feet apart in rows. At the end of June, 1908, this cane had reached a height of 8 feet, and the number of canes to a stool totalled 40, and the average weight of each stool 30 lb.

Its resistance to frost was manifested during June when exceptionally heavy frosts occurred which bleached the leaves of the adjoining varieties, viz., Mauritius Ribbon and No. 14, while the Indian Cane remained green.

An important feature of this cane is the slender upright stems with soft rind, which renders it easily eaten by stock, without being chaffed.

The dairy-farmer of the Clarence and Richmond having suitable soil and location, with a couple of acres of this cane, has in it the best substitute for ensilage and a safe standby summer and winter.

If used in conjunction with other fodders possessing higher protein content, we have a good milk producer, but when used alone the tendency is to fatten at the expense of the milk yield. October is the best month for planting.

Fertility of Teosinte (*Euchlæna luxurians*) Seed grown at Belindigarbar Experiment Farm.

From tests made by Mr. A. H. Haywood, Manager of the Belindigarbar Experiment Farm, near Grafton, with Teosinte seed, it has been found that 78 per cent. germinated. The light and immature seeds were removed by winnowing.

This is an extremely satisfactory result, as this very valuable forage plant does not mature seed in the cooler parts of the State. Supplies have hitherto been drawn from hot climates outside New South Wales.

As a green fodder for dairy cattle it is strongly recommended.

Feeding Milking Herds.

H. R. ALEXANDER,
Experiment Farm, Wollongbar.

WITH the exception of the cows of town and suburban dairymen, the feeding of dairy cattle in this State has so far not received the attention it deserves.

Every year our dairy farmers are becoming more convinced of the advantages to be gained by growing and conserving sufficient fodder at least to carry their stock in fair condition through the winter and dry summer periods.

Nothing could be more disheartening to the dairyman than to see a fine spring opening out, and his cows too low in condition to allow of the responding at once in milk with the new growth of feed. When grass becomes plentiful the poor cow takes some considerable time to come properly on in her milk. This means a falling off in cows' milk yield for this particular lactation period. Further, a cow low in condition is liable to go down under a too liberal supply of fresh young grass.

On the other hand the fed animal being in good heart and having no condition lee-way to make up, increases at once in her milk flow with the spring grass. Knowing this, the farmer should feed not only his milkers but the dry cows as well.

Under our New South Wales dairying conditions the farmer must regulate his cows and fodder crops to suit his particular district. The cows should be bred so that the majority are at full profit during the period at which, on the average, it is found feed is most abundant. The balance of herd could then be bred to calve at intervals throughout the year.

To maintain a reasonable milk revenue at the period when the majority of cows are dry, say June to August, a good plan is to have all heifers replacing culled cows bred to calve at this time of year.

By so doing, milking being slack, the heifers can be broken in, udders attended to, &c., without unduly upsetting the yard routine. These heifers would not be again bred to bull till November or December, and would then work in with the main herd. To allow of economical management this regulating of dairy herd is advisable; less fodder is required to feed dry cows than milkers. Further, a small, comparatively freshly-calved lot of cows can be given every attention, an abundance of feed, and be made to milk heavily right through the winter without the farmer incurring any additional labour expenses.

In the lower South Coast grass feed is found to be most abundant from September to December. During January and February, having seeded, grass is usually somewhat dry, and failing good rains to stimulate a fresh growth, the milk flow will show a considerable shrinkage, unless the cows' feed is supplemented with some green fodder.

The South Coast farmer should, by growing crops, prepare for feeding his dairy herd from January, and to continue from then, if need be, right through the winter months. On the best managed properties a regular supply of green fodder could not always be maintained even during very favourable seasons. There would always be a break between the summer crops of maize and sorghum and the winter crops of oats, &c.; the gap between winter crops and spring grass would also call for attention.

To tide over these or other bad periods reserves of fodder are necessary. Stacks of oaten, lucerne, millet or meadow hay, and silage made from any of the crops already mentioned, should be on every farm.

Of all crops suitable for dairy-cow feed, lucerne and maize are the best. While maize flourishes on the South Coast, lucerne is only grown in isolated places, and in many instances with indifferent success. Lucerne hay is the ideal concentrated food for the dairy cow. Lucerne, fed in conjunction with either green maize or silage, makes practically a complete, home-grown milk-making ration.

Every dairy farmer having a suitable piece of land would profit by growing a few acres of lucerne.

To have a regular supply of maize and sorghum for cow-feeding from January, begin early in October by sowing a section of paddock sufficiently large to feed milking herd for one month, sowing as seed in this case one of the early maizes, such as Ninety-day or Early Leaming. Follow up this sowing at an interval of, say a fortnight, with another section of paddock, using in this case seed of Hickory King, Red Hogan, or any other tall growing maize.

Also sow at this time the main crop of corn for ensilage making.

Another sowing of maize could be made towards the beginning of December. From December to January, a suitable piece of land being available, as a catch crop a sowing of Ninety-day maize would, provided frosts held off, give a good cutting of green feed by April; this crop could be off the land in ample time to allow of ploughing and sowing for late crop of barley or oats.

During spring months two sowings of sorghum should also be made. Sorghum grows slower than maize, and though not so good a milk-making food, has the advantage of holding out after frost much better than the corn crop. Sorghum should come in as the fodder to follow maize. Amber Cane variety is good for early feed. Planters' Friend being the better winter stand-by, will cut fresh, though frost-bitten, well into June.

As there is always a risk of losing part of crop through heavy rains, it is advisable to either cut, bind and stook, or make into silage any sorghum required for feed after the month of May. Maize and sorghum yield enormous quantities of fodder to the acre, and are the South Coast farmers' principal siloing or ensilage crops. Cowpeas are often recommended as a heavy yielding summer fodder crop.

In warmer localities cowpeas undoubtedly are valuable. On the lower South Coast the writer's experiences of this crop grown on good land were far from profitable.

For a summer catch crop Hungarian millet is a success, can be harvested within ten weeks of sowing, yields a fine flaggy hay much relished by calves and cattle; it also makes excellent silage.

For winter green feed, oats and Cape barley hold pride of place.

Of the varieties of oats, when a crop of hay is looked for, Algerian is the best, being comparatively free from rust attack. Tartarian is the better variety for actual green feed, also makes a good hay, but is very liable to rust.

Cape barley is relished as a green fodder by stock; has no value as hay on account of the dangerous and disagreeable beard.

Rye flourishes better on poor country than oats or barley. As a green food stock eat it readily; has no value as hay. When oats or barley receive a fair start, and are fed off when from 6 to 8 inches high, as many as two, and, during very favourable seasons, three feedings can be got from the one sowing with an additional ton to the acre crop of hay from the oats.

When cut with a scythe or mower, oats or barley die out during frosty weather. If a subsequent feeding or hay crop is desired, cows must be allowed to do the mowing by grazing.

In feeding off allow the milkers from an hour to an hour and a-half every morning on the crop. Some farmers herd the cattle while grazing, confining them in rotation to certain sections of crop.

This had better be done when paddock has been sown at intervals of a week or fortnight, the green stuff being more advanced in growth on the early-sown portions of the field. When crop is all of one sowing and growth the cows may be left to themselves for the usual hour; they are too busy feeding for this short period to wander far and trample under foot much of the green stuff. Cows fed in this way, and given a reasonable allowance of hay at night, will freshen up wonderfully in their milk.

Oats being a soft bulky food, cows ration needs building up with a more concentrated fodder. Hay assists in regulating the bowels, thus preventing scouring, and in a way balances the ration.

In the south winter crops can be sown from March to May, and for early spring feed as late as June.

To obtain best results when feeding cows it is advisable to chaff and feed all fodder from troughs. In feeding chaffed ensilage troughs are absolutely necessary. When cattle are fed in this way their allowance of ensilage, maize, or sorghum can be balanced up to a full milk making ratio by the addition of concentrates, in the form of lucerne, oaten, or meadow hay, bran or oilcake, as the case may be. To obtain best results from a milking cow this balanced ration is necessary.

A cow may be being fed as much ensilage as she can eat and still not be milking up to what her average would be if running on good grass.

Ensilage, green maize, or sorghum are the bulky cheap appetite satisfying foods, but are deficient in protein—the necessary milk making element.

To get this protein for a heavy yield of milk from say ensilage, the cow would have to do the impossible and consume perhaps twice the weight of fodder she was capable of eating in the twenty-four hours.

To balance the ration the feeder reduces the bulky food, substituting an equal weight of the more expensive concentrated article and keeps on adding this food rich in protein and reducing the bulky, while the cow responds by increasing in her milk flow. When this point is reached no further addition of expensive fodder would make the cow milk any better.

During winter and dry spells every farmer should endeavour to feed his fresh milking cows a balanced ration. This ration is not needed in the case of dry stock or cows nearly dry, they can be kept in good condition when fed solely on ensilage.

However, as very few farmers have troughs the only alternative is to feed in the paddock.

By feeding ensilage or bulky food at night, and hay during the day, or *vice versa*, fairly good results will be got.

If possible choose sheltered hilly country for the feeding ground. Lay the fodder out in long thin lines; if dumped out in heaps, the cattle trample and spoil fully half the feed. Change direction of lines daily, this helps keep fodder clean.

During wet weather let the cows have the fodder as fresh from the slide or cart as possible. Cattle will not eat sodden hay or other food that has been lying out in the rain for hours.

By chain harrowing the manure on feeding ground during damp weather, dung is broken up, rubbish cleaned away, and the growth of grass on such places when spring sets in will be greatly accelerated.

Grow fodder, and in abundant seasons conserve the surplus. The days of dairy squatting are done. Good dairy country becomes dearer and more difficult to obtain every year.

To make ends meet the farmer must get more milk from his cows; this can only be done by feeding.

No matter how well bred an animal may be she cannot milk without a liberal supply of food.

THE "DAILY TELEGRAPH" FARRER SCHOLARSHIP.

THE regulations to be observed in connection with the above Scholarship originally provided that the first examination, which is to be held in December next, was to be open for all first-year students of the Wagga Farm School only, and the second, in December, 1909, was to be open for similar students of the Bathurst Farm School, and so on, in alternate years. It has now been decided that the Scholarship will be thrown open for competition between the students of both farms at Wagga and Bathurst at each examination, and further, that the successful student will be allowed to take his second year at any of the Agricultural Schools, the Hawkesbury Agricultural College, and the Wagga or Bathurst Experiment Farms, provided he has already spent one year at one of those institutions.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 97. *Eriachne obtusa*, R.Br., variety *glabrata*; new variety.

Botanical Name.—*Eriachne*, already explained, this *Gazette*, January, 1905, page 26; *obtusa*, Latin, blunt, or obtuse, referring to the appearance of the spikelets when in fruit.

Brown, in his original description (*Prodromus* 184), speaks of "glumis glabriusculis acutissimis perianthio *obtusiusculo* brevioribus."

This obtuse appearance is well brought out in the figure of the normal form figured in this *Gazette* for January, 1891, page 27, in which a specimen, probably of dry country origin, is depicted.

It will be observed that, in the new variety now figured, the spikelets have a more acute appearance.

Botanical Description (B.Fl. vii, 632).—A variable grass, usually 1 to 2 feet high, often branched in the lower part.

Leaves narrow, flat, or subulate, glabrous, or the lower sheaths sprinkled with rigid hairs.

Panicle loose, sometimes much-branched and 4 inches long, sometimes almost reduced to a raceme of half-a-dozen spikelets.

Spikelets ovoid, about 2 lines long, appearing acute when young, assuming the obtuse aspect when in fruit.

Outer glumes membranous, acute, with fewer nerves than in most species (usually five) sprinkled on the back and ciliate with a few long hairs, rarely quite glabrous.

Flowering glumes about as long, more obtuse, rarely with a minute point, densely ciliate to the top, and sprinkled on the back with spreading hairs.

Palea entire, slightly hairy.

Grain much flattened.

Value as a Fodder.—"A fairly good pasture grass, suitable for sheep; it is variable as to height, but generally branches much from the base, and before seeding makes a good leafy bottom." (Bailey.)

Mr. P. Corbett, of near Wilcannia, calls it "No. 8 Wire Grass," which sums up his view as to the value to pastoralists of the normal form.

The variety is rather a wiry grass and although it is eaten by wandering stock, it is too scarce to pronounce an authoritative opinion in regard to its fodder-value.

Habitat and Range.—Found in all the States, except Tasmania and Victoria. Believed to be exclusively an interior species until discovered in 1897 in the Port Jackson district.

ERIACHNE OBTUSA, R BR.
VARIETY GLABRATA.)

This variety, for which the variety name *glabrata* is proposed, was discovered by Mr. W. Forsyth near Rose Bay. Owing to the spread of Sydney in this direction it cannot now be found in this locality and is believed to be exterminated. Fortunately the same observer has found it a few miles north of Port Jackson, at no great distance from the sea, and this discovery leads one to hope that additional coastal localities connecting the Queensland ones may be found. It is an almost glabrous form, with no woolly hairs on the base of the stem as in the desert forms; the outer glumes are quite glabrous, and the hairs on the flowering glumes are shorter and more oppressed than in the typical form. See a note by Mr. Betche and myself in the *Proceedings of the Linnean Society of New South Wales* for 1897.

Speaking generally, this is an interior or dry country species. In Queensland, however, as in the case with so many of our western plants, it approaches the coast. The typé was obtained from the tropics or the Endeavour River, &c. (Cook and Banks), or from Gulf of Carpentaria or Arnheim's Land localities.

EXPLANATION OF PLATE.

1. Entire plant, natural size.
2. Upper portion of panicle.
3. A single spikelet.
   a. Persistent outer glumes.
   b. Deciduous flowering glumes.
   c. Paleas of the two flowering glumes.
4. One of the two flowering glumes with palea and grain.
   b. Flowering glume.
   c. Palea.
   d. Grain.

Analyses of Soils from the Eden District.

SAMPLES of soil from the following places were submitted to Mr. F. B. Guthrie for analysis and report :—

Soil Samples.

Parish of Bimmil :—

Bag marked No.		
1—Soil 4 inches deep.	Shown on parish map thus ... ... (1).	
2—Subsoil about 18 inches deep		
3—Soil 4 inches deep.	do ... (2).	
4—Subsoil about 24 inches deep.		
5—Soil 5 inches deep.	do ... (3).	
6—Subsoil 14 inches deep.		
7—Soil 18 inches deep, overlaying drift about 9 inches deep.	do ... (4).	
8—Soil overlaying drift referred to not less than 36 inches deep.	(Alluvial).	

Parish of Victoria :—

Bag marked No.	
1a—Soil 6 inches deep.	Shown on county map thus ... ... 1a.
2a—Subsoil 12 inches deep.	
3a—Soil over 3 feet deep, alluvial.	do ... 3a.

Parish of Wallagaraugh :—

Bag marked No. 4a—Soil from Nadgee Swamp from 10 to 30 feet deep. Shown on county map thus ... ... 4a.

Parish of Pambula :—

Bag marked No. 5a—Soil taken from portion 209, 8 inches deep. Shown on lithograph.

Parish of Yowka :—

Bag marked	
X^1—Soil 2 inches deep.	Shown on parish map thus ... .. X^1.
X^2—Subsoil 15 inches deep.	

Parish of Nullica :—

Bag marked A—Soil, stony, 12 inches deep, overlying slate formation. Shown on parish map thus... ... ... A.

This sample may be taken as representing a large area of land in the parish of Nullica and other parishes south.

The following are the analyses accompanied by a soil report :—

Sample marked No. 1.

Locality of soil—Eden district, parish Bimmil.
Nature and depth of soil—4 inches, light loam.
Colour of soil—Dark grey.
Reaction of soil—Strongly acid.
Capacity for water—41·5 per cent., fair.
Absolute weight per acre, 6 inches deep—1,615,674 lb.
Capillary power—6·1 inches, good.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over $\frac{1}{4}$ inch diameter—·00 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—·54 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—12·54 per cent.
Fine soil { Sand—60·00 per cent.
Fine soil { Impalpable matter, chiefly clay—26·92 per cent.

Analysis of Fine Soil.

Moisture—1·39 per cent.
Volatile and combustible matter, principally organic—5·65 per cent.

Percentages of Fertilising Substances.

General value.

Nitrogen—·050 per cent. (equal to ·061 per cent. ammonia), deficient, equivalent to 807 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity 1·1.

Lime (CaO)—·146 per cent., satisfactory, equivalent to 2,358 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—·012 per cent., bad, equivalent to 193 lb in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·042 per cent., indifferent, equivalent to 678 lb. in an acre of soil 6 inches deep.

Report.—Speaking generally, the soil is sour and is deficient in plant-food. It is a light, easily worked, rather gravelly loam, and the present sourness will probably disappear under cultivation. It is advisable to add lime at the rate of about 8 cwt. per acre. It will require fairly heavy manuring in order to get the best results. When the land is sweetened it should grow any crop suitable to a light soil and the climate of the district. The ordinary green fodder crops, fruits, and vegetables, should do well.

Sample marked No. 3.

Locality of soil—Eden district, parish Bimmil.
Nature and depth of soil—Light sandy loam, 4 inches.
Colour of soil—Brown.
Reaction of soil—Faintly acid.
Capacity for water—40·7 per cent., fair.
Absolute weight per acre, 6 inches deep—1,642,829 lb.
Capillary power—5·6 inches, good.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over ½ inch diameter—·00 per cent.
Coarse gravel, more than $\frac{1}{16}$ inch diameter—·26 per cent.
Fine gravel, more than $\frac{1}{80}$ inch diameter—9·40 per cent.
Fine soil { Sand—73·73 per cent
Impalpable matter, chiefly clay—16·61 per cent.

Analysis of Fine Soil.

Moisture—1·41 per cent.
Volatile and combustible matter, principally organic—4·49 per cent.

Percentages of Fertilising Substances.

General value.

Nitrogen—·065 per cent. (equal to ·079 per cent ammonia), fair, equivalent to 1,068 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity 1·1.

Lime (CaO)—·154 per cent., satisfactory, equivalent to 2,530 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—·014 per cent., bad, equivalent to 230 lb. in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·041 per cent., indifferent, equivalent to 674 lb. in an acre of soil 6 inches deep.

Report.—A light sandy soil, of a brownish colour. The volatile matter consists largely of particles of burnt timber. It is a very poor soil chemically, and will require fairly heavy manuring to get good results. Both this and No. 1 soil will benefit more from organic manures, such as bone-dust, dried blood, &c., than from chemical fertilisers. The potash, in which the soil is deficient, must be supplied in sulphate of potash or wood-ashes, if the latter are available. Should grow any crops suited to the district.

Sample marked No. 5.

Locality of soil—Eden district, parish Bimmil.
Nature and depth of soil—Light loam, 5 inches.
Colour of soil—Light gray.
Reaction of soil—Acid.
Capacity for water.—34·3 per cent., low.
Absolute weight per acre, 6 inches deep—1,846,485 lb.
Capillary power—7·2 inches, good.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over ¼ inch in diameter—·00 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—·94 per cent.
Fine Gravel, more than $\frac{1}{50}$ inch diameter—17·80 per cent.
Fine soil { Sand—60·70 per cent.
{ Impalpable matter, chiefly clay—20·56 per cent.

Analysis of Fine Soil.

Moisture—·87 per cent.
Volatile and combustible matter, principally organic—3·36 per cent.

Percentages of Fertilising Substances.

General value.

Nitrogen—·043 per cent. (equal to ·052 per cent. ammonia), deficient, equivalent to 793 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity 1·1.

Lime (CaO)—·086 per cent., fair, equivalent to 1,587 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—.015 per cent., bad, equivalent to 276 lb. in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·042 per cent., indifferent, equivalent to 775 lb. in an acre of soil 6 inches deep.

REPORT.—A very similar soil to No. 1. See remarks to this. These soils, and all the soils from Bimmil parish, will benefit by the application of vegetable matter to form humus, in which they are deficient. This can be done either by liberal dressings of farm-yard or compost manure or by growing and ploughing under a green crop, so as to incorporate it with the soil. This, on decaying, will supply humus, and improve the texture of the soil and its water-holding capacity.

Sample marked No. 7.

Locality of soil—Eden district, parish of Bimmil.
Nature and depth of soil—Light sandy soil, 18 inches.
Colour of soil—Dark grey.
Reaction of soil—Faintly acid.
Capacity for water—38 per cent., fair.
Absolute weight per acre, 6 inches deep—1,758,234 lb.
Capillary power—7·5 inches, very good.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over ¼ inch diameter—·00 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—·54 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—32·66 per cent.
Fine soil { Sand—56·10 per cent.
{ Impalpable matter, chiefly clay—10·70 per cent.

Analysis of Fine Soil.

Moisture—1·72 per cent.
Volatile and combustible matter, principally organic—5·10 per cent.

Percentages of Fertilising Substances.

General value.

Nitrogen—·078 per cent. (equal to ·095 per cent ammonia), fair, equal to 1,371 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity 1·1.

Lime (CaO)—·171 per cent., satisfactory, equal to 3,006 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—·041 per cent., indifferent, equal to 721 lb. in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·056 per cent. fair, equivalent to 984 lb. in an acre of soil 6 inches deep.

REPORT.—Similar to 1 and 5. Same remarks apply as in the case of these soils.

Sample marked No. 1a.

Locality of soil—Eden district, parish Victoria.
Nature and depth of soil—Loam, 6 inches.
Colour of soil—Dark brown.
Reaction of soil—Strongly acid.
Capacity for water—35·5 per cent., fair.
Absolute weight per acre, 6 inches deep—1,439,172 lb.
Capillary power—5 inches, fair.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over $\frac{1}{4}$ inch diameter—7·60 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—2·00 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—5·40 per cent.
Fine soil { Sand—34·33 per cent.
Impalpable matter, chiefly clay—50·67 per cent.

Analysis of Fine Soil.

Moisture—5·35 per cent.
Volatile and combustible matter, principally organic—13·66 per cent.

Percentages of Fertilising Substances.

General value.

Nitrogen—·155 per cent. (equal to 188 per cent. ammonia), good, equivalent to 2,230 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity, 1·1.

Lime (CaO)—·064 per cent., indifferent, equivalent to 921 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—·053 per cent., fair, equivalent to 762 lb. in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·063 per cent., fair, equivalent to 906 lb. in an acre of soil 6 inches deep.

REPORT.—The principal defects in this soil are its present sourness and deficiency in lime. Thorough cultivation and the application of about $\frac{1}{2}$ a ton per acre freshly-slacked lime should remedy these defects, when the land should prove a fertile one, as it is well supplied with humus and the elements of plant-food. Cultivation will improve its water-holding power. At present it has a very low nitrifying power, the lowest of any of this batch, but the treatment recommended will improve it in this respect, and it should, without doubt, prove a very fertile soil.

Sample marked No. 4a.

Locality of soil—Eden district, parish Wallagaraugh.
Nature and depth of soil—Peaty, 10 to 30 feet.
Colour of soil—Black.
Reaction of soil—Acid.
Capacity for Water—96·8 per cent., very high.
Absolute weight per acre, 6 inches deep—651,700 lb.
Capillary power—Over 10 inches, excellent.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over $\frac{1}{4}$ inch diameter—·00 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—00 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—1·10 per cent.
Fine soil { Sand—2·00 per cent.
Impalpable matter, chiefly vegetable matter—96·90 per cent.

Analysis of Fine Soil.

Moisture—27·00 per cent.
Volatile and combustible matter, principally organic—26·87 per cent.

Percentages of Fertilising Substances.

General Value.

Nitrogen—·353 per cent., (equal to 4·28 per cent. ammonia), good, equivalent to 2,300 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity, 1·1.

Lime (CaO)—·095 per cent., fair, equivalent to 619 lb. in an acre of soil 6 inches deep.
Potash (K_2O)—·027 per cent., bad, equivalent to 176 lb. in an acre of soil 6 inches deep.
Phosphoric acid (P_2O_5)—·232 per cent. good, equivalent to 1,512 lb. in an acre of soil 6 inches deep.

REPORT.—This is a peaty soil, and would be much improved by the addition of lime at the rate of about $\frac{1}{2}$ ton per acre. It is more suitable for use as a top-dressing or for incorporating with stiff or sandy soils deficient in humus than for use alone.

Sample marked No. 5a.

Locality of soil—Eden district, parish Pambula.
Nature and depth of soil—Stony loam, 8 inches.
Colour of soil—Light grey.
Reaction of soil—Faintly acid.
Capacity for water—20 per cent, very low.
Absolute weight per acre, 6 inches deep—2,118,027 lb.
Capillary power—2 inches, poor.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over $\frac{1}{4}$ inch diameter—34·14 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—32·00 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—6·20 per cent.
Fine soil { Sand—15·40 per cent.
Impalpable matter, chiefly clay—12·26 per cent.

Analysis of Fine Soil.

Moisture—1·89 per cent.
Volatile and combustible matter, purely organic—6·56 per cent.

Percentages of Fertilising Substances.

General Value.

Nitrogen—0·72 per cent., equal to ·087 per cent. ammonia) fair, equivalent to 1,525 lb., in an acre of soil 6 inches deep).

Soluble in hydrochloric acid, specific gravity 1·1.

Lime (CaO)—·546 per cent., good, equivalent to 11,564 lb. in an acre of soil 6 inches deep.
Potash (K_2O)—·074 per cent., fair, equivalent to 1,567 lbs. in an acre of soil 6 inches deep.
Phosphoric acid (P_2O_5)—·047 per cent., indifferent, equivalent to 995 lb. in an acre of soil 6 inches deep.

REPORT.—This is a very stony, poor land, and will require the expenditure of a good deal of time and trouble, followed by fairly heavy manuring, to get good results. Good cultivation, together with the application of lime, followed by green manuring (ploughing under a green crop, such as cow-pea) to provide humus is essential. The soil is deficient in humus, and very poor in its relation to water. The addition of vegetable matter, either by green manuring as suggested, or by liberal dressings of farm-yard or compost manure, will improve the water-holding and capillary power of the soil and increase its fertility. The above treatment will bring it into good condition. It will still require fairly heavy manuring if good yields are to be obtained.

Sample marked No. X^1.

Locality of soil—Eden district, parish Yowka.
Nature and depth of soil—Sandy loam, 2 inches.
Colour of soil—Black.
Reaction of soil—Acid.
Capacity for water—42 per cent., fair.
Absolute weight per acre, 6 inches deep—1,683,560 lb.
Capilliary power—9·6 inches, excellent.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over ¼ inch diameter—·00 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—11·32 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—40·60 per cent.
Fine soil { Sand—30·00 per cent.
Impalpable matter, chiefly clay—18·08 per cent.

Analysis of Fine Soil.

Moisture—4·36 per cent.
Volatile and combustible matter, principally organic—15·79 per cent.

Percentages of Fertilising Substances.

General Value.

Nitrogen—·149 per cent. (equal to ·181 per cent. ammonia), satisfactory, equivalent to 2,508 lb. in an acre of soil, 6 inches deep.

Soluble in hydrochloric acid, specific gravity 1·1.

Lime (CaO)—·731 per cent., good, equivalent to 12,306 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—·037 per cent., indifferent, equivalent to 623 lb. in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·102 per cent., satisfactory, equivalent to 1,717 lb. in an acre of soil 6 inches deep.

REPORT.—The soil is a fairly good soil, and if deepened should prove a fertile one. It is well supplied with lime and with humus, and its relations towards water are satisfactory. It is a good nitrifying soil, being the best in this respect of the present batch, and should not require any special treatment. It is, however, very shallow, and its value will depend upon the nature of the subsoil, and whether it can be incorporated with the surface to deepen it. From the appearance of the sample of subsoil submitted, there would appear to be no difficulty in thus deepening it. The operation should be done gradually, taking up 1 inch or so with each successive ploughing.

Sample marked No. A.

Locality of soil—Eden district, parish Nullica.
Nature and depth of soil—Stony loam, 12 inches.
Colour of soil—Light fawn.
Reaction of soil—Strongly acid.
Capacity for water—23 per cent., very low.
Absolute weight per acre, 6 inches deep—2,131,604 lb.

Mechanical Analysis.

Root fibres—·00 per cent.
Stones over $\frac{1}{4}$ inch diameter—22·54 per cent.
Coarse gravel, more than $\frac{1}{10}$ inch diameter—24·20 per cent.
Fine gravel, more than $\frac{1}{50}$ inch diameter—9·00 per cent.
Fine soil { Sand—22·66 per cent.
Impalpable matter, chiefly clay—21·60 per cent.

Analysis of Fine Soil.

Moisture—1·25 per cent.
Volatile and combustible matter, principally organic—4·10 per cent.

Percentages of Fertilising Substances.

General value.

Nitrogen—·037 per cent. (equal to ·045 per cent. ammonia), deficient, equivalent to 789 lb. in an acre of soil 6 inches deep.

Soluble in hydrochloric acid, specific gravity, 1·1.

Lime (CaO)—·081 per cent., fair, equivalent to 1,626 lb. in an acre of soil 6 inches deep.

Potash (K_2O)—·056 per cent., fair, equivalent to 1,194 lb. in an acre of soil 6 inches deep.

Phosphoric acid (P_2O_5)—·038 per cent., indifferent, equivalent to 800 lb. in an acre of soil 6 inches deep.

REPORT.—A very poor, sour, stony soil, requiring the same treatment as recommended in the case of 5a. Liming is especially important, as the soil is very sour. It is also poor in plant-food, and will require fairly liberal manuring. Organic manures, such as blood and bone manures, will probably do better than the more soluble chemical ones.

Report by Fruit Expert on the land lying between Gosford and Mangrove River.

Department of Agriculture,
Sydney, 6th July, 1908.

I HAVE the honor to report that on the 2nd and 3rd instant, accompanied by Mr. Saml. Moore, jun., I inspected part of the country lying between Gosford and the Mangrove River, passing through portions of the parishes of Gosford, Narara, Popran, Eglington, Stowe, and Kooree, where I saw a good many thousands of acres admirably adapted for the culture of passion-fruit. I mention this fruit first as there is no part of Australia, and I think I may safely say the world, where this fruit will do as well. The better portions of the land will grow a good orange, while on some of the richer and heavier parts good apples could be grown. There are only small areas where this fruit would do, and these are mostly found in the gullies and along the banks of creeks, where the soil is usually deeper and richer than in most other parts.

Persimmons could also be grown to perfection on most of the better portions. Lemons, plums, peaches, and nectarines could also be grown in places.

After leaving Gosford there is very little (if any) Crown land available, until after the 7-mile post is passed, which is quite close to Woodlands, the well-known orchard of Mr. C. Robinson, and also that of Mr. Alex. Hunter. Both of these gentlemen have tried a goodly variety of the different kinds of fruits.

Even after passing these orchards it is found that most of the larger blocks of best land lying in close proximity to the main road for the next 5 miles, is taken up. There are, however, a few blocks on which could be found from 10 to 30 acres of land suitable for cultivation, but most of the best land has been selected in fairly large blocks along the road; but on leaving the main road at Bald Hill, at the 13-mile post, some good Crown lands were found in the parish of Popran, from 3 to 4 miles from the main Gosford Road, and lying close to Mr. J. Bushell's 400-acre farm, and to the east of it.

Lying to the south, and across the creek, there is more good land, which is not more than 7 miles from Mangrove Wharf.

Returning to the Gosford-Mangrove Road, some fair land is still open for selection, not far from the 14-mile post, but from here to Mangrove the greater portion of the best land has been selected recently. There still remain, however, many blocks on which some good land can be found, but the larger portions of the blocks are composed of poor worthless soil, and to get the good the poor also must be taken, so that it makes that portion which is fit for fruit-growing very expensive.

Taking the Yarramalong Road, which joins the Gosford between the 15th and 16th mile posts, some fair land was seen on several of the unselected blocks, but the best land is found after leaving the Yarramalong Road at its junction with the Wollombi Road, not far from the village reserve; and lying between 2 and 5 miles distant can be found one or two thousand acres of the best land, equal to that lying around Mr. Bushell's farm. No doubt if one had time to prospect, thousands of acres of such land could be found lying away from the road, and not discernible from it.

The village reserve on the Yarramalong Road is a splendid piece of soil, on which some very fine timber is growing. The greater portion of the best land lying along the road is taken up, as far as my inspection went, which was to within about 3 miles of Yarramalong.

Returning to the Gosford Road, most of the good land between this point and Mangrove, and lying in the immediate vicinity of the road (a distance of about 6 miles), is selected. From what I could learn from old settlers there are many places scattered through the bush where good land can be found in different sized areas.

In the parish of Olney, lying to the north of Stowe, there is to be thrown open on the 9th instant some of the best land in that district.

On the map (not reproduced) and marked in red ink, is some of the best land open for selection which I saw during my trip. The land in question is mostly heavily timbered, and very expensive to clear. It cannot be classed as rich, but is chiefly light, easily worked, and will always require liberal applications of manure, and would also benefit by the application of lime. There will be room for men with money as well as those without much, if they have muscle and will, but it is not a country for the man who has a natural aversion to work, as for the first three or four years the pioneer will have a big fight with the giants of the forest. After the second year some very handsome returns can be looked forward to from the passion-fruit. The man who has had previous experience in fruit-growing, and who is thoroughly practical, is the man who will do well in that district.

It may be asked: what about the price of passion-fruit if a few thousand acres were planted in that district? My reply is: Can them when they are cheap, as also all of the small and inferior ones, and only market the best.

If we cannot succeed in placing the fresh passion-fruit on the Old Country market, we can at least easily place the canned article, and the growers might easily co-operate and run their own cannery at a central spot, for which purpose I would recommend that a 20-acre block be reserved adjoining the creek, somewhere close to the 14-mile post on the Gosford-Mangrove Road.

I would not recommend the extensive planting of apples, peaches, nectarines, or plums, as I consider passion-fruit and oranges would be the most suitable crops to grow, so long as there is much trouble with the fruit fly.

There is very little of the land suitable for growing crops. It is purely fruit land, except in a few isolated spots.

As heavy falls of rain are occasionally experienced, good large drains are a necessity, to prevent the washing away of the light soil. The country is rolling, and well watered, and in my opinion no one person should be allowed to select or lease more than 120 acres, as that is quite a sufficient area for any one man to make a living from at fruit-growing, and as I said before the land is of little or no value for anything else.

Mr. Parsons informed me that there was a very fine waterfall about 1½ miles off the Mangrove Road, somewhere between the 8th and 9th mile posts, and he suggests reserving this and protecting the ferns, &c., which are growing around, and beautifying it. Unless this is done it will not be long before vandals will remove and destroy that which at present makes the spot beautiful.

Messrs. Robinson, Hunter, and Black have all proved that passion-fruit will yield up to £100 per acre at the third year. Mr. Black, who started three years ago, claims that he has already marketed £300 worth of fruit from 6 acres, and he says there is as much fruit remaining on the vines as he has taken off. It has been well demonstrated, therefore, that this fruit does well on this poor soil, especially when handled by practical orchardists.

I have, &c.,

W. J. ALLEN.

[This report was obtained from the Fruit Expert for the benefit of a number of men who had heard of this district and wished to secure blocks at the alluring price of 10s. per acre fixed by the Lands Department. A number of practical fruit-growers from the County of Cumberland have taken up blocks for themselves or their sons. These men of life-long experience in fruit-growing have faith in the district, especially for passion-fruit and citrus fruits. There are large tracts of absolutely useless land, where outcrops of ironstone and quartz gravel, with vegetation consisting of burrawangs, grass-trees, stunted and gnarled white gums and ti-tree, proclaim its sterility. But there are occasional patches of deep sandy loam with which the practical men are well satisfied if they get 40 out of a block of 100 acres. Cost of clearing is £10 to £12 per acre. The highest point on the range crossed between Gosford and Mangrove is 1,200 feet above the sea; the climate is delightful, the rainfall generally abundant, above 50 inches; the outlook over Terrigal and the sea-coast is very beautiful where glimpses can be got as the Penang Mountain is climbed, and the prospects for the man who can do his own clearing, and most of his building, and can afford to wait for two years, are fairly encouraging.—*Ed.*]

Phalaris Commutata.

Mr. W. H. Webb, of Bathurst, contributed the following paper on *Phalaris commutata* to the *Daily Telegraph*, 17th June, 1908:—

On May 24, 1907, I saw an account of Mr. Furphy's success in the Gippsland district with *Phalaris commutata*. He obtained some plants from Mr Harding, Curator, Botanic Gardens, Toowoomba (Q.), and put them out at the end of April in drills 3 feet apart, and each plant 2 feet apart. By the end of June they had grown 2 feet, and by the end of the season 167 seed stems were on some of the plants. The highest averaged 7 feet, while some were 8½ feet. The clumps measured 2 feet across. The grass stood a severe winter well, and showed no yellow leaves. The crop yielded at the rate of 60 bushels of seed to the acre, and 8 tons of hay. In forty-five days it was 3 feet high from the time of cutting at the end of January, during dry weather, in 1907.

Such an account would make most persons try to get such a grass. At all events I mentioned it to Mr. E. T. Webb, Mr. Perry (of O'Connell Plains), and Mr. F. A. Webb (manager of Springfield, near Orange), to whom I sent a package of seed. We got four packets of the seed, at 5s. each. The one I got contained 125 seeds, and upon carefully weighing them on a gold scale I made the cost about £70 per lb. Not being too sure of the best time to sow these costly treasures, I had sixty-three seeds sown on August 2, 1907, leaving the remainder with the gardener to sow later on. Unfortunately, the mice made short work of them, and all were lost.

On September 20, 1907, thirty plants grown from the sixty-three seeds were all we had. These were transplanted near a sprinkler in a good spot in the garden at Hathrop, on rich chocolate soil, on which vegetables had been grown the previous year. When put out in rows 2 feet wide, and the plants 1 foot apart, they were well watered, and afterwards all were frequently watered, except a few at the ends of the rows that were not reached by the water from the sprinkler. The weeds were kept down. Under these favourable circumstances it grew apace. I noticed that the plants at the ends of the rows, that did not get the water, were at least 60 per cent. behind the others. The rain was very short—September 21, 46 points; October, 30; November (better), 819; December, 142; January, 226: February 1, 265, increased by the end to 290. Dry conditions followed—March, 21 points; April, 69.

On April 20, 1908, some of the rows were thinned out, and the bunches split into 132 plants, containing from three to five seed stems, and put into similar soil, but drier, and more clay, near a sprinkler, and within 30 feet of an Osage Orange hedge, standing at least 30 feet high, on the southern side. This would keep the cold southerly winds away, but our prevailing cold winds come from the west. The roots of this hedge extends at least 40 feet into the garden, and generally retard growth. All of the *Phalaris commutata* plants were well watered when transplanted, without cutting the tops, and they came on without serious check, doing so well in the dry time that followed that they were not watered until June 9. The total rainfall for April was 69 points, only 6 of which fell after the removal; May, 110; and June to date, 33 points. On June 9, about eight bunches on the hardest of the soil that caked hard, and were very small when put in, had done only fairly, but the rest had grown splendidly, the seed stems counting from sixty to eighty-two on each plant, and many being 12 inches long. The frosts were very severe. On the grass the thermometer has recently recorded 11 and 12 degrees, being 21 and 20 degrees respectively below freezing point.

On May 19 and 20, 1908, the balance of the thirty plants grown from the seeds were split and transplanted in a cosy spot, where they can be watered if necessary. They were put out in rows 2 feet apart each way. On account of the previous lot doing so well without cutting the tops off, these were not cut. The very severe frosts above referred to (which caused waterpipes to burst and ice to form in the bedrooms of some houses where people slept with the windows open) cut the tops back seriously, and turned them all black, during some twelve days after being put out. They were at once cut off from 1 inch to 2 inches above the ground, and are now coming along splendidly.

The finest bunch taken up on May 19 measured 28 inches by 18 inches across the roots when the bunch was upside down, and when turned back on the roots 66 inches by 59 inches across the bunch from end to end of the seed stems, many of which were 18 inches long, hence the solid part of the top of the bunch was 30 inches across. We put out 670 plants on May 19 and 20, varying in size from five to fifteen seed stems, from the balance left in the ground on April 20, 1908.

We feel pretty safe now, as we have 802 plants, and a small plot sown to seeds obtained from a few of the plants that ran to seed.

The grass was always a rich green colour, soft and nutritious. It sends its numerous fibrous roots well down into the ground, and these spread below the surface; the seed stems shoot out round the plant all the way around. From what I have seen of it this appears to be going on all the year round. Prior to the plants seeding the stems shot up higher than the leaves, and longish heads formed about ⅜ inch in diameter at the bulb, tapering slightly at the top, and about 2 inches in length. At the top the seed stems shot up, and as they ripened they dried off, but other young stems kept coming on.

At Littlebourne, about 4 miles out of Bathurst, on a hill, Mr. E. T. Webb sowed his packet in two lots, one in a hothouse, the other in July out in the open. This did much better than the other. The land is hard, light, clayey stuff, mixed with decomposed granite, and cakes very hard in dry weather. It was just the place for a test in comparison with the test at Hathrop. The grass grew well, although only watered twice during a dry time, and all ran up to seed much earlier than the Hathrop plot. The stems died off in the hot summer after seeding, and very little grass showed. The rains and cool weather brought the green shoots up again, and they are green now. One plant that he had sowed in the garden, and had well watered, kept green all through.

Phalaris commutata is an Italian grass, and the original of that mentioned herein was imported from America for the Toowoomba Experimental Farm in 1884, with a lot of other grasses, and on account of the great drought none did any good; hence all were dug out, and thrown away on a rubbish heap. Some years afterwards a beautiful grass was observed doing well where the roots, &c., were thrown. This was *Phalaris commutata*. We have not yet tested this grass practically as a fodder.

Interim Report from the Experiment Farms.

Hawkesbury Agricultural College.

No accurate experiments made to ascertain feeding qualities or value for hay. Leaves and stems are soft and succulent. It grows to a height of 2 feet 6 inches, can easily be plucked, and cures into what is apparently a good hay. Is a splendid grass for winter or spring feed. Resists frost exceedingly well, and is not equalled in this respect by any of our other grasses. The roots were transplanted early in June, and fresh leaves 3 to 4 inches in length formed during an almost unbroken succession of heavy frosts. Grows well up to about December, when it seeds. Appears to resist drought well and is not easily killed by heat. Has not been grown under ordinary pasture conditions.

Wagga Experiment Farm.

Without irrigation do not think it likely to make a good hay grass, but as a pasture grass it proves very promising. Rainfall for last three months was little over 5 inches, and the grass has stooled very well during that time.

Bathurst Experiment Farm.

The grass made a desirable growth throughout the summer; it grew continuously during the winter and withstood severe frosts; no signs of frosting were apparent. It grows a compact crown which withstands considerable tramping; from this crown, seed stems are sent up, which are harsh and comparatively sparse. For this reason, under the local conditions, it could not be a desirable grass for hay-making. Sheep eat the grass readily. Owing to unfavourable conditions none of the plants produced seeds.

Wollongbar Experiment Farm.

Is an excellent winter and good summer grower. As a winter grass it should prove of considerable value in Richmond River district, is unaffected by frosts, grows freely, remains green right through the winter, and carries a soft, flat, succulent leaf, readily eaten by stock. Should make palatable hay.

Compared with Prairie grass, it is a much better summer, but not so vigorous a winter, grower, and has the advantage over Prairie by being a perennial. Fully 6,000 roots have been distributed free to local farmers during the past month.

Cowra Experiment Farm.

Have not sufficient data to warrant any definite statements. The grass was planted about twelve months ago and made little growth during last summer. At present it is making more rapid growth, and is very fresh and succulent.

Glen Innes Farm.

Growth during winter months is really wonderful, is a great stooler, provides a great quantity of apparently very succulent undergrowth. Seeds sparsely, but from appearance is one of the very best of frost-resisters. A fodder plant of very great promise. Have not yet tested it for hay, but the head is soft, although the straw appears somewhat hard. If cut very green, however, it should make fair hay. It grows to a good height.

Grafton Experiment Farm.

Experiments not sufficiently advanced to draw any conclusions. Basing an opinion on tests made at Wollongbar, do not think this grass will prove very suitable for North Coast district. It is more suitable for cooler climates and more adapted as a fodder than a pasture grass.

A Local Market for Linseed.

UNDER the Bounties Act of 1907, which is now in force, provision is made for the payment of a total sum of £329,000 (spread over a term of years) as bounty for the production in Australis of certain specified articles.

Among the articles are Flax and Hemp, on which a bounty is offered of 10 per cent. on market value of fibre for a period dating from July 1, 1907, extending over five years. The maximum amount which may be paid in any one year is £8,000; and in connection with linseed oil, the material obtained from the seed of the flax plant, a duty of 10 per cent. is offered on the market value, over a period of five years; the maximum amount which may be paid in any one year being £5,000. The minimum quantity of Linseed which a grower must produce is 5 cwt.

Messrs. Thompson, Fraser, and Ramsay, of 365 Kent-street, Sydney, call the attention of the Department of Agriculture to the fact that Linseed Oil Mills have been established at Parramatta, and that they are the only oil mills of their kind in the Commonwealth, and the firm, Meggitt (Ltd.), Parramatta, for whom Messrs. Thompson, Fraser, and Ramsay are agents, are buyers of linseed seed.

A sample of oil submitted by the firm was tested by Mr. Guthrie at the Chemical Laboratory of the Department, and he reports observations taken indicate that the sample submitted is pure Linseed Oil.

Should any farmers be contemplating attempting to grow flax and linseed, it is satisfactory to know there is a local firm prepared to buy the seed. Notice forms of "Intention to claim bounty" are obtainable on application to the Department of Agriculture.

Paspalum dilatatum and Clover.

C. F. JULIUS.
Central Bucca.

THE necessity of providing some auxiliary grass in our predominant paspalum pastures is yearly becoming more evident. The excellence of paspalum as a good strong reliable grass under every circumstance has been already proved, and it deservingly holds with us first place. Yet it is much a disappointment to the stock owner that, even with abundant paspalum, something seems lacking to make a complete grass feed for his stock; while, in the spring, paspalum does not respond as promptly as could be desired, and therefore we are at this season continually at a disadvantage, and unnecessarily so. To make a perfect ration paspalum requires the addition of some leguminous crop, such as lucerne, cowpeas, or clovers; and passing over the first two named as presenting some difficulties in cultivation, we come to clover, and in clover we see the promise of certain relief.

Whilst almost every other grass is compelled to give way and perish before the development of paspalum, it is remarkably noticeable that clover is almost, if not altogether, the only exception to the rule. This delicate-looking plant, the joyful herald of spring, seems to find in the midst of the paspalum stronghold a protection for its own bloom. Surely "out of the strong comes forth sweetness," in other words, if paspalum is "king" of the gramineæ, may not clover be termed the "queen" of the leguminosæ. In any case paspalum seems to cherish the society of clover as its necessary consort, and the sight of a strong combined growth of paspalum and clover has often aroused much wonderment in the beholder. Probably paspalum cultivates a clover growth for the sake of its nitrogenous element. However that may be, the paspalum grower should adopt nature's suggestion, burn his old paspalum paddocks and sow clover—White clover preferably—also in every new sowing never omit a proportion of clover seed.

NOTE.—The Editor would strongly emphasise this sensible advice: Neither paspalum nor any other grass or fodder-plant is a complete food for production of meat or milk. It is a badly balanced ration, and must be supplemented by some leguminous plant. At the present time the paddocks along the Tweed and Brunswick Rivers, and less strikingly in the Richmond River district, are white with clover blossom, and all cows on such mixed pastures are doing well—if they are watched and not allowed to take too much clover and get "hoven." All dairy farmers, who find that paspalum has taken complete possession of their paddocks, should sow 3 lb. of White Dutch Clover and 1 lb. of Perennial Red Clover per acre. If clover does not thrive, it will pay well to top-dress with 5 cwt. of lime per acre. Lime made from the burning of shells will probably be cheaper, and quite as effective as stone lime, in the coastal districts. Dairy farmers cannot be too strongly urged to sow a legume with every fodder crop, vetches with barley, lucerne or red clover with oats and wheat for hay, cowpeas with maize and teosinte. To supplement the fodder, increase the feeding value, bring mineral matter from the sub-soil with their deep roots, gather nitrogen from the air by means of the bacteria in the root-nodules, furnish a second bite of green food after the main crop is cut, and improve the soil both mechanically and chemically, giving a richer and more friable sod for the succeeding crop—whether roots or grain. Study the composition of the best pastures—natural and artificial, and you always find trefoils, medic, vetches or clover present. Learn the lesson, and put it into practice.—ED.

Meteorological Bureau, No. 4 Division, New South Wales.

Weather Conditions during August, 1908

S. WILSON,
Divisional Officer.

At the beginning of the month severe cyclonic weather developed over the eastern districts of New South Wales, from an extensive monsoonal dis turbance which on the 1st covered the eastern half of Australia. This disturbance enclosed a closed-curve depression, which had travelled southward from the Gulf of Carpentaria at the rate of 600 miles per day, until on the night of the 2nd it reached the south coast of New South Wales as a cyclonic disturbance, its proximity being indicated by strong easterly gales. During the 3rd and 4th, as it moved north-eastward, heavy rain, strong, and in parts whole gales, and very rough seas marked its progress. One of the best rainstorms over the State for many months resulted from this distribution of pressure. The largest amounts registered between July 27 and August 7 were, 1,808 points at Bondi, 1,626 at Randwick, 1,566 at Sydney, 1,539 at Turramurra, 1,167 at Kiama, 1,110 at Parramatta, 1,095 at Manning Heads, 1,193 at Byron Bay, 1,042 at Katoomba, 1,012 at Lawson, 1,004 at Nowra; and, speaking generally, many others ranging between 1 inch and 10 inches.

Finer conditions set in over western areas on the 4th, but the unsettled showery weather persisted until the morning of the 7th on the coast, when the rain area showed a tendency to work northward.

On the South Queensland Coast, a depression which had been lingering thereabouts since the 5th, gradually developed into a disturbance there on the 7th, causing south-east to easterly winds, strong to gales, with heavy rain and rough seas, as far southward as our North Coast districts.

On the 8th an energetic disturbance was shown over the southern districts of West Australia, having its lowest barometric values between Albany and Eucla, where very high seas and southerly gales occurred. The continent otherwise was covered by a very extensive anticyclone, which stretched eastward beyond New Zealand, and governed fine conditions generally over the area it covered, excepting on the coast and highland districts of New South Wales, where some light to heavy rainfall was registered. The largest amounts reported were 245 points at Lismore, 225 at Casino, 175 at Nambucca, and 163 at Tweed Heads.

By 9 a.m. on the 10th, rapid movements of the pressure systems had taken place; the anticyclone above mentioned had tilted north-eastward, and now occupied only the eastern districts of the continent. The antarctic disturbance had worked as far eastward as Melbourne, and another high pressure with its centre over the West Australian goldfields covered the

greater part of Australia. With this distribution partial rains were recorded in various districts; in New South Wales light to heavy on the coast, and in West Australia light to heavy generally in the S.W., extending to Winning Pool; otherwise the falls were light to moderate.

Between the 11th and 14th the weather of the continent came wholly under anticyclonic control, and fine conditions, for the most part, ruled in the various states. Persistent rough seas, however, obtained on parts of our coast, especially to the north.

Speaking generally, the temperature in New South Wales between the 8th and 14th inclusive, was rather mild; the registration of 70 degrees being exceeded in various parts on many occasions. The highest points reached were 80 degrees at Mungindi, 78 each at Moree, Gunnedah and Nymagee, 76 at Walgett, Pilliga, Casino and Murrurundi, and 75 at Urana and Narrabri.

The lowest temperatures were experienced between the 1st and 14th inclusive, during which Kiandra registered 15 degrees, Marsdens and Cootamundra each 26 degrees, and Inverell, Queanbeyan, Coonabarabran and Molong each 27 degrees.

Between the 15th and 22nd, a very extensive anticyclone and two antarctic depressions were shown on the isobaric charts. The high pressure system covered the entire continent, and attained its maximum intensity (30·4 inches) on the 15th and 17th. Fine, cold weather ruled for the most part during its passage, excepting here and there a shower or two along the southern and eastern seaboards. On the 17th the disturbance was very extensive, occupying the Tasman Sea, south of lines joining Melbourne, Norfolk Island and Wellington (New Zealand), and resulting in fresh to strong N.W. to S.W. winds along the shores of the south-eastern States, with rough seas in Bass Straits. During the next 24 hours the area of disturbed seas expanded along the New South Wales coast and around Tasmania, and in several instances hail was experienced in Tasmania.

On the 19th and 20th, the greater portion of the disturbance was located over New Zealand, and the following high pressure had advanced eastward, bringing with it fine weather conditions for the most part. The passage of this disturbance across the southern districts of the Continent was attended by some light rainfall and strong westerly blows at various places. At Sydney during the 16th, a west-north-west gale blew for a short period at the rate of 55 miles per hour.

The second depression made its first appearance on the 17th in the S.W. corner of Australia, and travelling eastward at normal rate, covered an area south of lines joining Esperance, Alice Springs and Wilson's Promontory on the 21st. With its approach cloudy, unsettled weather affected the western districts of our State, and during the night of the 20th, or early morning of the 21st, light rain was recorded south of the Murrumbidgee and in the extreme north-east and south-west. In South Australia, light to moderate rain was experienced in agricultural areas south of Quorn, and in north-western and western pastoral country. In West Australia, light to moderate

falls generally from Hamelin Pool and Peak Hill; Queensland, light to heavy and scattered on N.E. Coast and Peninsula.

During the week, 22nd to 28th inclusive, an anticyclone for the most part controlled the weather of Australia, and consequently fine conditions predominated, excepting on the 22nd, when, as the result of the presence over the south-eastern States of an antarctic depression, unsettled to showery weather obtained there generally, as also along the southern seaboard of the Continent

The rainfall recorded over New South Wales was light to heavy, and chiefly confined to southern and eastern districts. The heaviest falls were:—103 points at Corowa, 99 at Ulladulla, 88 at Wyalong, 85 at Bateman's Bay, 75 at Ungarie, 72 each at Coolamon and Marsdens, 71 at Tumbarumba, and 70 each at Henty, Morangarell, and Yetman.

The centre of the anticyclone was first shown on the 22nd over the West Australian Goldfields, and later, travelling along the shores of the Great Bight, it gradually increased in barometric value until 30·5 inches was attained on the 25th between Adelaide and Fowler's Bay. On the 27th, a slight retrogressive movement of its advance isobars resulted in strong west to south-west winds over Victoria and Tasmania, and rough seas in and around Bass Straits.

The highest and lowest temperatures reported (between the 22nd and 28th) in New South Wales were:—Western Division: 86 at Bourke and 29 at Euston. North-west Plain: 81 at Moree and 34 at Pilliga. Central-western Plain: Quambone and Coonamble each 77, and Carinda 30 degrees. Riverina: Hillston and Cudgellico each 73, and Narrandera 26 degrees. North-western Slope: Gunnedah and Narrabri each 78, and Tamworth 26 degrees. Central-western Slope: Wellington 72, and Coonabarabran 22 degrees. South-western Slope: Barmedman 68, and Cootamundra and Murrumburrah each 26. Northern Tableland: 70 at Tabulam, and 25 at Armidale and Walcha. Central Tablelands: Cowra 70 degrees, and Bathurst and Carcoar 31 degrees. Southern Tablelands: Goulburn 62, and Kiandra 12 degrees. North Coast: Clarence and Kempsey each 77, and Lismore 33 degrees. Hunter and Manning: Jerry's Plains 75 degrees, and Scone and Jerry's Plains each 28 degrees. Metropolitan: Parramatta 71 and 36 degrees. South Coast: Bega 73, and Bowral 25 degrees.

The distribution of the rainfall over the State for the month was as follows:—

		Average Points. Below.		Above.
Western Division	from	131	to	192
North-western Plain	,,	45	,,	192
Central-western Plain	,,	81	,,	111
Riverina	,,	91	,,	7
North-western Slope	,,	164	,,	106
South-western Slope	,,	195	,,	22
Northern Tableland	,,	104	,,	212
Central Tableland	,,	71	,,	615
Southern Tableland	,,	214	,,	411
North Coast	,,	36	,,	879
Hunter and Manning	,,	211	,,	355
Metropolitan	,,	268	,,	639
South Coast	,,	64	,,	737

The Past Winter.

The past season, on the whole, furnishes a good example, both as regards rainfall and temperature, of the weather usually experienced in New South Wales during winter. Prolonged spells of fine, frosty weather attended the passage over of the high pressure systems, and, on the contrary, erratic periods of thunderstorms, with hail, snowstorms, and gales, rough seas, and heavy, soaking rainfall, associated with a cyclonic storm, as also a warm wave in July sandwiched in between two cold periods.

During June the total rainfalls in the various subdivisions of the State were, for the most part, below the average. Indeed, more than three-fourths of New South Wales had amounts which were discrepant. Some relatively very dry tracts of country were shown on the monthly charts, especially on the Central and Southern Tablelands and Coastal districts. Within the area bounded by lines joining Nowra, Mount Victoria, and Wyong, little or no rainfall was experienced, Windsor and Nowra having had none whatever, and at other stations the falls ranged from between 3 and 43 points. On the other hand, Riverina, the South-western Slope and the southern border of the Western Division experienced amounts which were above the average.

Compared with June of last year, the rainfall of June, 1908, presented some interesting features. For, whereas Riverina and the South-western Slope, in the latter period, were practically the only divisions with falls above average, the chart for June, 1907, showed that those two regions for the most part were the only places with rainfall below normal. In most of the other subdivisions of the State, however, June, 1907, was a splendid month as regards rainfall. During last June, 1908, some very low temperatures were registered in each of the divisions, the absolute lowest being experienced at Kiandra with 2 degrees, or 30 degrees of frost. At Sydney, the mean temperature, 51·3 degrees, was 3 degrees below average; and the extreme minimum, 39·1 degrees, registered on the 25th, was only 1 degree less than the absolute lowest during the past 49 years, recorded on June 29th, 1862.

July, 1908.

Speaking generally, the rainfall during July was below the average over fully two-thirds of the State. The greatest disparities were experienced on the north-eastern quadrant, and over the greater part of the Slopes and Plains, ranging from 120 to 356 points below the average on the North Coast, from 68 to 170 on the Northern Tableland, and from 24 to 170 below on the Plains and Slopes.

On the other hand, the north-western quadrant experienced totals much in excess of the average amount, and which, perhaps, represent the best winter falls in those parts for some considerable time. Some very good falls were also experienced on the coast between Port Macquarie and Jervis Bay, where, as the result of the persistent rainstorm from the 27th to the 31st, inclusive, the totals were considerably larger than the average. The heaviest falls for the month were: 1,204 points at Mosman, 1,159 at Sydney, 1,151 at Port Stephens, 1,121 at Seal Rocks, 1,053 at Newcastle, 1,002 at Glebe Point, and other amounts ranging from 981 at Cape Hawke to 195 at Wollongong. uo

July 9th, a very heavy thunder and hailstorm was experienced in the city and suburbs; and on the 20th a warm wave developed from combined antarctic and monsoonal influence, the 9 a.m. readings of the temperature reaching well into the seventies. At Sydney, the maximum—73 degrees—established a record for the season. This temperature was exceeded in July on only three occasions during 49 years, and eclipsed all maximum records in June since 1872, when 74·7 was registered on the 24th.

The totals during August were more satisfactory than those of either June or July, for, excepting Riverina and the Central districts of the State, falls more or less in excess of the average have been experienced. As a result mainly of the rainstorm in the early part of the month, a great preponderance over the normal amount appears in the totals of many stations in the coastal, highland, and metropolitan districts. The largest figures were: In the Central Tablelands, 1,111 points at Lawson, and 1,035 at Katoomba; on the Southern Tablelands, 743 at Araluen, 489 at Crookwell, and 472 at Nimitybelle; on North Coast, 1,341 at Byron Bay, 1,228 at Tweed Heads, 773 at Casino, and 754 at Lismore, Hunter, and Manning, 782 at Camden Haven, and 732 at Port Macquarie; Metropolitan, 968 at Sydney, 805 at Kurrajong, and 694 at Parramatta; South Coast, 1,124 at Kiama, 1,018 at Ulladulla, 934 at Wollongong, and 908 at Nowra.

Temperature of the past Winter.

Notwithstanding the occurrence during certain days of some relatively warm weather, the temperature over the State generally during the winter of 1908 may be said to have been below the average. The departures from normal, in degrees, are shown in the following table, for representative stations:—

	Albury.	Eden.	Forbes.	Newcastle.	Port Macquarie.	Walgett.	Bourke.	Wilcannia.	Wentworth.	Hay.	Dubbo.	Sydney.
June	−4·0	−5·0	−4·5	−2·3	−2·8	−4·1	−4·4	−3·6	−3·8	−4·8	−2·6	−3·0
July	0·0	−3·2	−1·2	−0·2	−0·7	−0·9	−2·8	−1·0	−0·6	−1·7	−0·4	−1·0
August	+0·3	−4·2	−1·5	−1·2	−0·6	−1·9	−2·5	−3·0	−1·2	−2·4	−0·3	−0·8

Comparison with India.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia as far as data are available, for the month of August, 1908:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	inches.	degrees.	
Simla (India) ...	−·02	−0·6	Large excess.
Melbourne (Victoria)	+·08	−2·4	Slightly below average.
Sydney (N.S.W.) ...	+·05	−0·8	Below normal central districts, otherwise generally above.
Adelaide (S.A.) ...	+·07	−1·2	Above normal in North, below in South.
Perth (W.A.) ...	+·08	−1·1	Defect throughout.

During last month in both India and Australia temperature was below the average, the largest defect being over two degrees at Melbourne. Over Australia, the barometric pressure was somewhat greater, but in India, slightly less than the normal.

A large excess of rainfall was experienced in India, whilst, judged as a whole, the Australian States were not so fortunate; the above statement showing that, although the greater part of New South Wales and northern part of South Australia were above normal, yet Victoria, West Australia and parts of the other States, suffered a deficiency.

CLIMATOLOGICAL table for the month of August, 1908, compiled from daily telegraphed returns.

Station.	Mean Barometer at 9 a.m.*	Temperature. Mean Maximum.	Mean Minimum.	Absolute Maximum.	Date.	Absolute Minimum.	Date.	No. of days below 40 deg.	Rainfall, Inches.
Walgett	30 21	66·0	40·7	76°	11	32°	18	12	2·56
Bourke	30·19	66·2	41·2	86	22	30	18	14	0·99
Wilcannia	30·18	60·5	41·2	84	22	34	20, 26, 27	9	1·14
Wentworth	..	61·0	41·1	70	15	34	25, 26, 27	12	1·42
Hay	30·20	62·3	36·7	70	11	30	12	20	1·13
Deniliquin	30·23	57·7	38·0	65	11 & 15	30	20	14	1·17
Albury	30·20	60·5	37·2	67	7	30	26	17	2·01
Forbes	30·22	58·0	38·7	70	22	32	14 & 20	14	1·10
Dubbo	30·15	63·1	37·5	72	11	31	17, 18, 20, 28, 29, 31.	14	0·86
Clarence Heads	30·17	64·1	49·5	77	24	43	19 & 28	0	5·85
Port Macquarie	30·15	64·4	45·8	71	12 & 31	36	2	5	7·32
Newcastle	30·15	61·0	49·1	69	12	42	19	0	3·77
Sydney	30·163	61·1	46·8	72·2	22	40·9	26	0	9·679
Jervis Bay	30·16	55·8	47·0	62	10 & 22	36	21	1	7·44
Eden	30·20	52·1	43·7	61	27	38	26	3	2·89

* Corrected to 32 deg. F. and M.S.L.

Seasonable Notes.

GEO. L. SUTTON,
Wheat Experimentalist.

Wheat Exhibits at Shows.

In the Southern wheat districts the show season is now in full swing. A few remarks relative to the classes for wheat will be opportune and relevant.

The majority of agricultural societies are actuated by a desire to so arrange their schedules that the prizes offered shall have the effect of directly encouraging the adoption of better methods in the different sections of agricultural practice. With some classes the results have been very satisfactory, but in others quite as unsatisfactory, *e.g.*, the majority of those classes arranged for the encouragement of good farming in the wheat districts.

The general practice to encourage the best methods in connection with wheat growing is to offer a prize for the best sample (generally a bag) of wheat. Such exhibits have a certain value at country shows, more especially when the classes for them are open ones and are properly included in the schedule, but their influence is not in the direction intended. They show the quality of wheat the various districts represented are capable of producing, when it is cleaned under the best conditions, which often include laborious hand-picking, and which is quite in order. The exhibition of a bag of grain should not be hampered by any restrictive conditions regarding cleaning or winnowing; the very nature of the class, which is a competition for "the *best* bag of wheat," implies that a miller's sample is required, and as wheat for the miller cannot be cleaned too well, any restrictive conditions are out of place, and the most thorough methods are permissible. At a miller's, or at a metropolitan exhibition, when supplementing a class for growing crops, such classes are of great interest and of considerable educational value, but their influence for the improvement of methods of farming is very small.

These classes, rather than encouraging good farming methods, mainly, though indirectly, encourage the manufacture of superior types of cleaning and grading machinery, which in its place is a most desirable thing to encourage, but in this instance is not achieving the object aimed at, viz., the encouragement of good farming methods.

The production of a fine sample depends rather upon the cleaning machinery a farmer possesses, than upon his ability to farm well. With good machinery a splendid sample can be produced from a crop grown by indifferent and slovenly methods.

With the object of inducing farmers to adopt better methods, at least one society has insisted upon the sample for exhibition being taken directly from the harvesting machinery in the paddock, and placed under seal until judging takes place at the annual show. This practice, whilst it is an advance upon the usual one, in that it ensures samples being taken under field conditions, is

also defective, in that it is still obviously an indirect encouragement to the machinery manufacture rather than a direct one to the farmer. In addition, this plan (if the farmer is influenced by the desire to win the prize, as it is intended that he should be) may unintentionally encourage a practice that is not commercially good. The prime object of harvesting is to secure all the grain produced, and to do this it is sometimes necessary to so adjust the harvesting machinery that it does not clean it as thoroughly as it is capable of doing, therefore under some conditions the production of an inferior show sample, *i.e.*, marketable grain with chaff amongst it, may be an indication of good, *i.e.*, profitable farming.

Some may think that the farmer should reclean his wheat thoroughly before selling it, but from a commercial standpoint it is questionable whether, under present conditions, it will pay a farmer to reclean his wheat after it has left the harvesting machine. It is probable that it will suit him better to accept a correspondingly lower price for his product than to instal machinery to reclean it. In any case it will only be very large farmers who will ever find it profitable to instal machinery sufficiently large to clean it in an economical manner, or as cheaply as it can be done by the millers.

From a farmer's standpoint the practice of offering a prize for the best bag of wheat, irrespective of any other condition, is objectionable in another way, for, as the most showy and attractive varieties are, sometimes, very poor yielders, it may prove an encouragement to the growth of unprofitable varieties.

Judging Standing Crops.

The real test of good farming is the production of good crops of varieties which have satisfactory characteristics. Good farming can, therefore, be encouraged by offering premiums for the best and cleanest crops, which shall be judged as they are standing, and the relative value of which shall be determined chiefly by their ability to yield well. I am sure that many societies have realised the necessity of encouraging the practice of better methods in this way; but few, very few, have attempted to do so, because of the difficulties surrounding the judging of such a class. The difficulties in this connection are great, but are not insurmountable, as is shown by the few cases in which classes of this character have been successfully judged.

From the nature of such a competition most of the competing crops will be widely separated, and can therefore be judged only by a pre-determined scale of points, which takes into consideration the factors that are indicative of good farming, and also such characteristics of the plant as make it a satisfactory and desirable variety in the field.

The time for judging growing crops will shortly be here; with the object of assisting those societies who have already initiated this class of competition, and also those who feel disposed to initiate it, the following scale of points for judging standing crops, drawn up by the late W. Farrer, in 1904, is submitted.

Scale of Points for Judging Standing Crops of Wheat.

The crops to be judged when quite ripe.

Qualities of Merit.	Maximum points.	Remarks.
Yield	25	The yield to be determined by harvesting a portion of the crop, at least $\frac{1}{40}$ acre in area. The winnowed grain, after the unmerchantable small grain has been rejected, to be weighed, and from this the yield per acre is to be computed.
Quality of sowing as indicated by evenness of stand.	9	....
Purity	6	Freedom from admixture of plants or other varieties.
Cleanness of crop...	9	Freedom from wild oats, weeds, &c.
Healthiness of crop	9	Freedom from rusts, smut, take-all, &c.
Ability of the heads to hold grain	9	It is necessary for the crop to be ripe to determine this.
Ability of the heads to protect the grain from rain.	5	....
Ease of thrashing...	5	....
Attractive habit of growth ...	4	.. ..
Suitability of harvesting by machinery.	6	....
Strength of straw...	10	Freedom from brittleness, with ability to carry well-filled heads. The crop must be ripe to determine this.
Scantiness of flag	3	Freedom from excessive leafiness.

So that the society at its annual show may derive some benefit from this class, a necessary feature of it should be a condition providing that a bag of the grain be exhibited at the show following the competition, and in order that the most might be made of the educational value of such a class, the bag exhibited should have details as to variety, yield, and the points awarded to the growing crop, affixed to it.

Judging Grain by Points.

Some agricultural societies are adopting the plan of judging by points. As this practice is likely to increase, the following scale of points for judging samples of wheat grain is given for the guidance of those who are interested in this phase of judging :—

Qualities of Merit.	Maximum points.	Remarks.
Weight per bushel	30	This carries with it plumpness, and a large proportion of those qualities which millers value most.
Brightness	10	A characteristic of high quality.
Translucency	20	The grain when cut across should be horny and hard, rather than soft and starchy.
Purity of sample	5	Freedom from grains of other varieties.
Cleanness	10	Freedom from weeds, seeds, smut, chaff, broken and damaged grains, rubbish, &c.
Uniformity	10	Size, colour, brightness, and general appearance.
Size of grain	5	....
Shape of grain :—		Smooth, not angular.
Crease... 4	10	Should be shallow, rounded, and
Brush... 3		Should be small.
Germ 3		Should be small, and not prominent.

Exhibits which are badly smutted, mouldy, musty, or contain a palpable admixture of varieties, should be disqualified.

Orchard Notes.

W. J. ALLEN.

OCTOBER.

Cultivation.—As the warm dry weather will soon be upon us, it is important to see that all weeds and crops which have been allowed to grow between vines and trees are turned under, and that all soil underneath such trees and vines has been well loosened. After each rain the soil should be worked up to prevent excessive evaporation. Under no circumstances should this necessary work be overlooked or neglected, as if this season should prove as dry as last, much will depend on the proper working of the soil during this and subsequent months. Where there is any neglect in cultivating, the orchardist need not feel disappointed should he lose his crop and possibly some of his trees.

Irrigation.—At each irrigation it is best to give the soil a good soaking. Where trees, vines, sorghums, or corn are growing, the water should be kept confined to the furrows, and under no circumstances should it be allowed to flood the land or stand around trees or vines. It is very important to cultivate after each irrigation, and this work should be done before the soil has time to cake, that is, just as soon as it is dry enough for the horse to work the cultivator without the soil sticking to it and the horse's feet. Lucerne, hay, and wheat crops may be flooded, but water should not be allowed to stand on the land after once it is well soaked but should be drawn off without delay. else the result would be patches of drowned lucerne or hay, and the probable cause will be ascribed to salts in the water rather than to neglect on the part of the operator.

Codling-Moth.—As all growers are compelled to keep their orchards free of this pest, it may not be out of place to remind them that the first spraying should be given as soon as the petals fall. The higher the pressure at which the pump is worked the better will be the results.

Stock Solution.—1 lb. of best white arsenic (arsenious oxide) and 2 lb. of washing soda boiled in 1 gallon of water for from 20 to 30 minutes, or until the mixture is quite clear, then add 1 pint of this stock solution to 40 gallons of water, to which has already been added from 6 lb. to 8 lb. of best freshly-slaked lime. If this latter precaution is neglected, the result will be serious damage to the foliage. Some varieties of apples are much more tender than others; for these use the larger quantity of lime. The arsenic is much cheaper than Paris green, and when bought in quantities should not cost more than about one-third as much per pound. For this State, I am of opinion that at least four sprayings will be necessary to keep the moth in check.

If it is desired to add bluestone to the arsenite of soda solution, 3 lb. of bluestone may be dissolved in 1 gallon of hot water, by suspending the crystals on the surface of the water in a bag of open material, and when thoroughly dissolved can be made up to 20 gallons by the addition of more

water. Now take 1 pint of the stock solution of arsenite of soda and dilute in 20 gallons of water in which from 6 lb. to 8 lb. of freshly-slacked lime has been added, and pour this into the bluestone mixture thus making the whole up to 40 gallons. Strain before using.

In spraying use as fine a nozzle as possible, the object being to cover the tree with a fine mist, without any of the solution running off.

Bandaging.—It will be necessary to get the bandages on the trees now, and these should be removed and examined every ten days after the grubs have made their appearance, and all grubs and chrysalids destroyed by cutting them in halves with a sharp knife carried for the purpose, or by squeezing them between thumb and fingers.

Budding and attending dormant buds and grafts.—If the sap is well up citrus trees may be successfully budded this month. Keep all dormant buds and grafts well disbudded so that the bud may get away good and strong. No suckers or shoots should be allowed to grow below the buds. It is also very essential that stocks should be cut back properly. The cut should be slanting, being slightly lower on the side opposite to the bud, and it is advisable to stake them, not only to prevent them being blown out, but to encourage a straight trunk.

Where grafts have been put in old trees, they are even more liable to be blown off than small ones and must be tied to prevent it. To do this a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end; then as the graft grows it can be tied to it.

Care of newly-planted vines and trees.—Keep all vines well disbudded. I have noticed in many small vineyards that this important work is neglected. Never allow any branch to grow below the crown of the vine. To do the work properly it will be necessary to disbud all vines from two to three times.

Keep a strict watch on all refills, and if these show any signs of wilting give them one or two buckets of water from time to time until they get a good start.

Disbud all newly-planted trees, leaving good shoots at least 4 inches apart along the trunk of the tree, and do not allow two or three shoots to start from the same place as so many have done, but give each branch a separate hold of the main stem.

Borers.—While working around trees watch for borers on the trunks and branches, as it is very easy when they are just starting their work to cut away the bark and find them—in this way keeping the orchard free of this pest.

As soon as the vines begin to grow, sulphur them for mildew at least once before blooming and twice if the weather is very damp. In coastal districts it is well to spray them immediately after the fruit is set with Bordeaux mixture, and should caterpillars of any kind be eating the leaves, add to the solution arsenite of soda as given above. Repeat the sulphuring from time to time, giving as many as eight applications if the season is at all damp. This will pretty well keep the oïdium in check.

Mussell Scale, Woolly Aphis, Lichen, Moss, &c.

No. 1. *Woburn* Improved Emulsion*: Caustic Winter Wash.—This may be used for removing moss, lichen from trees, and destroying mussel-scale, and possibly some other pests. The wash is identical with the Woburn wash, except that iron sulphate is substituted for soap.

Formula.—For 10 gallons of wash :—

Iron Sulphate	½ lb.
Lime	¼ „
Caustic Soda	2 „
Parrafin (kerosene)	5 pints.
Water to make	10 gallons.

Dissolve the iron sulphate in about 9 gallons of water; slake the lime with a little water to make it into milk of lime; run this into the iron sulphate solution through a piece of sacking, so as to remove any gross particles which might clog the spraying machine. The kerosene is then churned into the mixture, and the caustic soda added. It is not necessary to dissolve this separately in water before adding it, especially if it is in a powdered condition.

The amounts of the ingredients in this wash may all be varied to a certain extent without affecting the character of it. The kerosene may be increased or diminished almost *ad libitum*—so may the caustic soda; but if this is reduced below 20 per cent. the cleansing of the trees will not be perfect, and an increase beyond this quantity renders the wash more dangerous to the workman.

No. 2. *Woburn Improved Combined Emulsion and Fungicide.*

Formula.—For 10 gallons of wash :—

Copper sulphate	1½ lb.
Quicklime	½ „
Caustic soda	2 „
Kerosene...	5 pints.
Water, to make	10 gallons.

This is made in exactly the same way as the wash with iron sulphate. The amount of copper sulphate given is nearly the same as that used for "normal" Bordeaux mixture. In most cases this mixture will turn grey in the course of a few days, owing to the formation of copper oxide, and in course of time the basic sulphate would probably be entirely converted into oxide, and the mixture would lose its fungicidal properties. Lime-water cannot be substituted for milk of lime in this case.

Aphis, Caterpillars, &c.

No. 3. *Woburn Summer Insecticide and Fungicide.*

Bordeaux mixture (without caustic soda) may be emulsified with kerosene, and this forms a wash for destroying aphis, caterpillars, &c., as well as fungi.

Formula.—For 10 gallons of wash :—

Copper sulphate	10 oz.
Lime-water	8 gallons, 3 pints.
Kerosene	1 pint, 2½ oz.
Water, to make up to	10 gallons.

* Eighth Report Woburn Experimental Fruit Farm.

The Bordeaux mixture must be made thus:—Dissolve 10 oz. of copper sulphate in 1 gallon of water by suspending it in a piece of sacking. This must be done in a wooden or earthenware vessel. Take some good quicklime, slake it in a little water, and put it into a tub with about 20 gallons of water; the quantity of lime does not matter so long as it is not less than 1 or 2 lb. Stir the lime and water up two or three times and leave it to settle till the solution becomes quite clear. If it is left for any length of time the tub should be covered. From this clear solution syphon off 8 gallons 3 pints, and add to the sulphate of copper solution. Testing the solution for copper must by no means be omitted.

The kerosene in the above recipe amounts to 1·4 per cent., and may, of course, be reduced or increased according to circumstances.

The above solution may be made with iron sulphate instead of copper sulphate; it would be then much cheaper, but would possess no fungicidal properties.

Green Manuring in Departmental Orchard.

Test for copper in Bordeaux Mixture.

Put a few drops of a solution of potassium ferrocyanide into a white saucer with some water, and drop into this some of the clear liquid obtained after the Bordeaux mixture has been allowed to settle; any brown or red coloration indicates that there is copper in solution, and a little more lime-water must be then added to the mixture and the test repeated.

A wire nail, free from grease, dipped into the Bordeaux mixture will, if there is any unprecipitated copper present, become coated with a deposit of copper which appears like a stain on the iron; a bright knife blade is unsuitable as it does not become wet.

With the iron nail test, ·05 per cent. of copper sulphate may be detected, but with the ferrocyanide, ·005 per cent., or even ·002 per cent., when more delicate means of observing the colour are employed.

No more lime-water should be added than necessary to bring about complete precipitation.

Farm Notes.

HAWKESBURY DISTRICT—OCTOBER.

H. W. POTTS.

LIGHT showers fell last month, and favourable temperatures prevailing, vegetation responded on all sides. Our spring crops exhibit a rich healthy growth, and should these conditions last with an absence of hot westerly winds, we have the prospect of a good harvest. It should, however, be remembered that we have had three years of unexampled drought, and so far this year we have only had 21 inches of rain in contrast with the district's normal rainfall of 34 inches for twelve months; we have yet an anxious time ahead in which every precaution and method should be adopted to conserve soil moisture.

Preparation should be made for an early harvest. This includes overhauling the reaper and binder, and mower, and getting appliances and hauling gear into useful working order.

Lucerne.—The first crop to demand attention is lucerne. In some cases the first cut has been made, in many instances it is just ready. The indications in the plant of the first season's cut being ready is different to subsequent crops, seeing there is no flower to guide us. The time to cut is determined, in the absence of the bloom, by the length of the stem and the decay of the lower leaves, which turn yellow and readily fall. Care must be exercised to note this at the right time in order to mow. Wilt and dry the hay without losing the leaves, which contain the greater quantity of protein and nourishment for stock. At this time of the year lucerne hay making is surrounded with many difficulties in order to obtain a cut palatable and rich in colour. Where the stand is cut for the first time the intermixture of weeds and herbage renders it almost impossible to convert it into hay. It can be fed green to stock or conserved as silage.

With old stands after the hay has been removed it will be advisable to cultivate with the disc or ordinary harrow.

To loosen the soil around the plant, and even cut up the crown of it, always results in increased and vigorous growth.

During the early part of the month the final sowings of lucerne for a permanent stand may be made.

Maize.—The main crop of this most valuable plant should be planted now, both for green forage and grain.

About the middle of the month attention must be given to the young crops sown last month. They have germinated very well. When about 3 inches high they should be rolled to break down the furrow thrown out with the

drill plough. This should be followed by cultivation twice with a light three-leaf harrow, one week intervening between each operation. One week after the last harrowing, commence a regular series of operations in light or shallow cultivation with the spring-tooth cultivator or scuffler every fortnight until the plants are too high for the cultivator.

The importance of light cultivation this season cannot be over stated. Our soils are fairly moist at present, and the aim is to keep that moisture conserved solely in the interest of the maize plant to maintain a strong growth. With increasing temperatures, caked or baked soils and weeds, this essential and by no means too abundant moisture would soon disappear.

Systematic shallow cultivation destroys weeds. If not checked they utilise moisture and rob the maize plant of sustenance as well as light. A baked soil always encourages rapid evaporation. Stirring the soil, and loosening it, causes soil particles to lie closely and forms an effective earth mulch, through which evaporation is retarded, the soil is aërated, and plant food is rendered available for the growing corn.

Sorghum.—Further sowings may be continued this month, and with greater safety, seeing this plant is very susceptible to frost in its early stages of growth. The crops sown last month will require attention towards the end of this month, to keep the soil stirred well and check the growth of weeds.

Potatoes.—The main crop is planted. When the young plants are about 3 inches high, the harrow may be used to cultivate. Every three weeks a cultivator should be passed through each row until the flowering stage is reached. Then they can be hilled.

Sweet Potatoes.—It is surprising that this valuable and succulent tuber is not more generally used as an article of diet in the household, as well as for domestic stock. Light sandy soils afford heavy and profitable returns. When all chances of frosts are gone, the plants may be taken from the hot-bed, soaked in a mixture of cow-manure and water of creamy consistency and transplanted in rows 3 feet apart and 2 feet from each other. The soil should be enriched with fertilisers, 1 cwt. superphosphate and ¾ cwt. sulphate of potash to each acre. The best varieties to grow are Pink and White Maltese.

Pumpkins, Marrows, Squashes, and Melons.—The season is very favourable for the growth of this relishable and succulent class of fodder. Every corner and small plot of waste land with sufficient soil fertility, should be used to raise these useful crops.

The Pot-iron Squash, Crown, Rio, King of the Mammoths, Custard, and Chinese are all good sorts. The old Ironbark pumpkin has not been replaced as a profitable stock fodder, especially for pigs, during the hot weather.

Marrows.—Long White Bush and Moore's Cream are the best.

Towards the end of the month cultivation must be practised to give the plants a good start.

Cowpeas.—The main crop should be planted now, and where their place in the rotation is needed, the value of cowpeas as a green and relishable

fodder in the height of summer cannot be overlooked. Moreover, its remarkable power of restoring fertility to exhausted soils is one of their greatest qualifications.

The variety which so far has given the best yield is a compact bush sort known as Poona. Other sorts worthy of trial are Black, Iron, Whip-poor-Will, Clay Coloured, New Era.

The crops planted last month should now be cultivated and the soil kept well stirred.

Mangolds and Sugar Beets are sufficiently well forward to be cultivated and thinned.

Millets.—Whilst the paddocks are on all sides green with a fresh spring growth of grass and herbage, it is as well to be prepared for the early bleaching effects of summer, and be ready with a crop as green feed about the middle of December. Millets, Hungarian and White French, may now be sown to accomplish this. Soil moisture and conditions at present are ideal for that purpose.

Pastures.—Our experience during the past five years evidences the reliability of lucerne as a grazing plant to withstand harsh conditions of soil and drought. In several tests lucerne has survived the most trying ordeals.

In several paddocks we had a good growth of Paspalum dilatatum until the very dry seasons set in, when growth ceased, and only recurred as a result of rain or thunder storms during warm weather.

During the genial rains in April last paspalum responded remarkably well. The value of lucerne as a stock food cannot be over estimated. It equals bran in its food constituents, and is more palatable. In the ordinary pastures the addition of lucerne increases the feeding value of the grass, and takes the place of clovers where feeding qualities are so highly appreciated in colder countries. Lucerne is a most valuable substitute. It increases the quantity of protein per acre, when judiciously intermixed. It is a hardy plant, resists droughts, and is always green and succulent. Necessarily to ensure success in its growth the soil must be deep although not necessarily rich, and it must be well drained. The plant will grow to great depths in a hardy fashion in search of moisture and sustenance. With this experience in successfully substituting lucerne for clover, the grazing ration is increased in protein and well balanced when combined with, Paspalum dilatatum, Rhodes grass, or other pasture plants.

This month grasses may be sown in well cultivated areas in the following proportions :—

Paspalum dilatatum	3 lb. seed
Lucerne	1 „
or	
Rhodes Grass	5 „
Lucerne	1 „

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary	Date.
Queanbeyan P. and A. Association	E. O. Hinksman	Oct. 1
Bega A., P., and H. Society (Spring Show)	W. A. Züegel	,, 7
The Lachlan P. and A. Association	Thos. Cadell	,, 29
Adelong P. and A. Association	A. W. Molineaux	,, 13, 14
Menindie A. and P. Society	L. E. Underdown	,, 28
Lismore A. and I. Society	T. M. Hewitt	Nov. 11, 12, 13
Berry Agricultural Association	A. J. Colley	,, 24, 25, 26, 27

1909.

Society.	Secretary	Date.
Dapto A. and H. Society	G. A. McPhail	Jan 13, 14
Kiama A. Association	R. R. Somerville	,, 26, 27
Alstonville A. Society	W. W. Monaghan	Feb. 3, 4
Wollongong A., H., and I. Association	F. W. Philpotts	,, 4, 5, 6
Moruya A. and P. Society	John Jeffery	,, 10, 11
Shoalhaven A. and H. Association, Nowra	Henry Rauch	,, 10, 11
Guyra P., A., and H. Association	....	,, 16, 17
Kangaroo Valley	E. G. Williams	,, 18, 19
Manning River A. and H. Association, Taree	S. Whitehead	,, 24, 25
Gunning P., A., and I. Society	W. T. Plumb	,, 25, 26
Nambucca A. and H. Association, Macksville	M. Wallace	,, 25, 26
Tenterfield P., A., and M.	F. W. Hoskins	Mar. 2 to 6
Bega A., P., and H. Society	W. A. Züegel	,, 3, 4
Berrima District A., H., and I. Society, Moss Vale	I. Cullen	,, 4, 5, 6
Molong P. and A. Association	Charles E. Archer	,, 10
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 10, 11
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Central Australian P. and A. Association, Bourke	G. W. Tull	,, 19, 20
Murrumbidgee P and A. Association	A. F. D. White	Aug. 24, 25, 26

[1 Plate.]

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Agricultural Gazette of New South Wales.

Electricity and Agriculture.

W. H. P. CHERRY,
Department of Agriculture.

A FEW years ago Sir William Crooke in a Presidential Address to the British Association prophesied that the day was drawing nigh when resort to the aid of chemical science for the purpose of increasing the productivity of the soil and maintaining the supply of wheat would become necessary. Last year Professor Sylvanus P. Thompson declared that a shortage of wheat is already imminent. The available territory, at the present rate of production and consumption, he estimates as sufficient for 666 millions of people, and by the end of 1910 he reckons we shall have a wheat-consuming population equal to that number.

It may fairly be urged that both these scientists take a pessimistic view. Not only have they failed to recognise the vast possibilities of the Australian continent and other countries which so far have but little developed, but the gauging of these possibilities is at the best a matter of rough conjecture. The Commonwealth potentialities are great now, but with the achievement, for instance, of the projected inland sea, who can say how extensively they would be enhanced? That there are conflicting opinions regarding this scheme is of course admitted.

Furthermore, it remains to be seen what effect changed conditions of holding land will bring about, both in old and in new countries. The trend of modern legislation in connection with the question of the best disposal of the land in the interests of the whole community, instead of for the advantage of a grasping few, cannot fail to have an influence on the general food supply. In the dictum of the famous scientist (Crooke), that "starvation may be averted through the laboratory," and, presumably, only through that channel, there is a somewhat gratuitous assumption that all other means are practically exhausted. It is the province of that class of social economist who looks more to the fuller utilisation of the existing circumstances, to show that we ought still to be a long way from the *absolute necessity* for adopting the scientific methods advocated for increasing natural production.

Nevertheless, while not a matter of sheer necessity, it may still be recognised as a very desirable course to pursue. The application of such methods may be more advantageous than cultivating larger areas of land. In the advance of science it is possible, for instance, that the application of electricity, chemistry, or other scientific treatment, to an area of 1,000 acres of wheat, might be more profitable, and entail considerably less labour than the ordinary cultivation of an additional 500 acres, which would thus remain available for other use. In this connection the scope of the present article is to collate the information bearing on the recent developments of electricity as applied to agriculture, both directly and indirectly.

The main points dealt with in this paper are the following:—

(1) The fixing of atmospheric nitrogen by electricity in the production of the fertilising agent known as Calcium Nitrates, by the Birkeland-Eyde process.

(2) A second process of a similar character resulting in the production of the fertiliser called Calcium Cyanamide or Nitrolim.

(3) The depletion of the Chilian saltpetre fields.

(4) The direct application of electric light and heat to plants, under the Thwaite system of electro-culture, at the Royal Botanic Gardens, London.

(5) Radio-culture in connection with the Thwaite system, and also apart from electricity.

(6) The experiments of Professor Lemstrom in the direct application of the electric current to cultivated fields.

(7) The French system of utilising atmospheric electricity in agriculture.

(8) The preliminary electro-culture experiments of the United States Agriculture Department.

(9) The recent experiments of Sir Oliver Lodge, Principal of the Birmingham University.

(10) Preliminary investigations at the Hawkesbury Agricultural College.

(11) Experiments with electrified seed-wheat in South Australia, and with various seeds at Werris Creek.

(12) The practicability of establishing nitrogen-fixing industries in Australia, and the probable forces available for generating the electricity.

(13) Electricity in farm household life and in field machinery operations in other countries.

(14) The same in Australia; lighting and motive power; at the Hawkesbury College; anticipated extensive introduction of electric machinery in rural operations; farm telephone systems in New South Wales.

The Atmospheric Nitrate Works at Notodden, Norway.
Illustration from *The World's Work.*

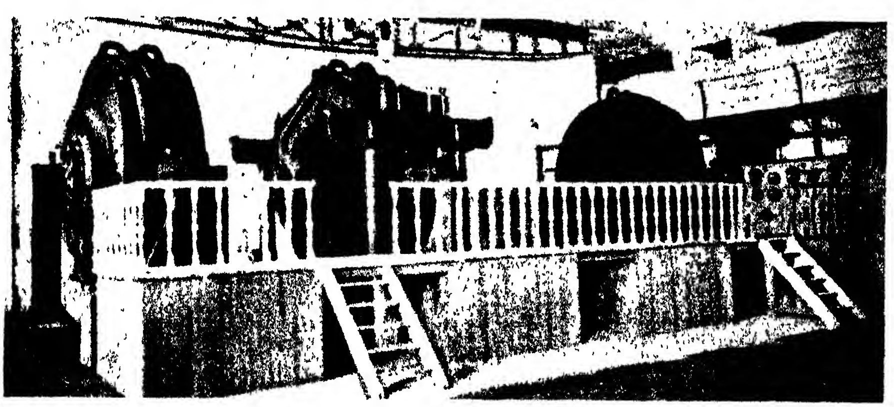
1. Manufacture of Atmospheric Nitrates.

Birkeland-Eyde Process.

In October, last year, Professor Thompson, in an article in *The World's Work*, entitled, "When wheat fails," shows how electricity may be utilised to produce the new fertilising agent, nitrate, with the object of ensuring the continuance of an adequate supply of grain. That nitric acid can be generated by the chemical combination of nitrogen and oxygen, by means of an electric spark, has been a known fact for more than a century, but the production of nitrates on a scale which promises to be of commercial advantage is a scientific achievement of very recent date, and Professor Thompson explains the processes.

Ten years ago certain experiments Sir William Crooke was making in this direction strongly suggested a possible solution of the food problem. He came to the conclusion that if the supply of electric energy could be generated at a cost of 1-17 of a 1d. per unit (*i.e.*, per kilowatt hour), nitrate of soda could be manufactured at £5 per ton. Chilian saltpetre, nearly 75 per cent. of the output of which is used for manuring wheat-fields, sells at the present time at more than double this price.

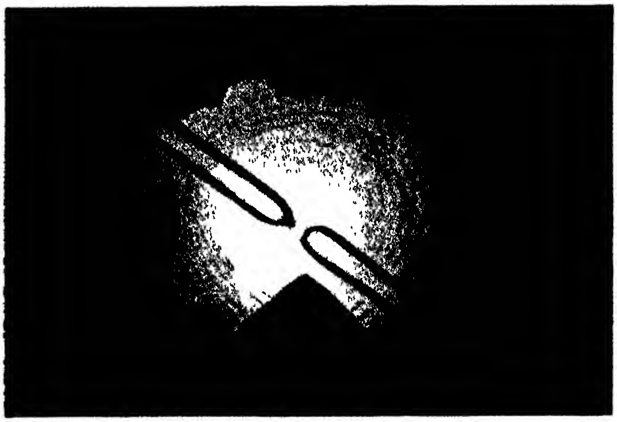
Since the time of Crooke's experiments, the fixing of atmospheric nitrogen has become an accomplished fact; in Scotland and Germany in connection with mining products; and, finally, in Norway a factory has been successfully established where, under the name of Norwegian saltpetre, nitrates are directly produced from the atmosphere on a commercial scale. Discoveries made by Professor Kristian Birkeland in the course of certain investigations



Group of Birkeland-Eyde Electric Furnaces, each of 800 h.p.

in connection with the phenomena of the Aurora Borealis, led eventually to further examinations into the action of a transverse magnetic field upon an electric arc, formed when an alternating electric current is passing between the tips of two conducting rods, the result being the production of pure nitric acid. The acid is absorbed by treatment with limestone and caustic lime, thereby producing nitrate of lime. This product is concentrated and packed in canisters. The Professor's collaborator in this achievement was Samuel Eyde, a Christiana engineer.

Commencing with a modest experimental plant of only 25 horse-power, operations expanded rapidly, until a factory was built at Notodden, in the Hittersdal, with a horse-power of 2,400, supplied by the Tinnfos Waterfall. Shortly after this came into operation it became necessary to increase the output tenfold in order to meet the demand for nitrates, and another waterfall, capable of 26,000 horse-power, was called into requisition. Other similar projects are now in course of development in Scandinavia, and a large water-power factory is also being erected in Italy.



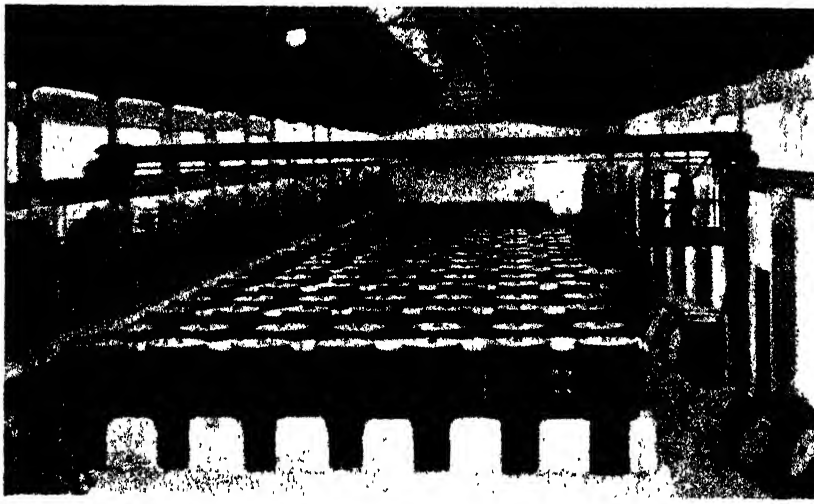
Interior of the Birkeland-Eyde Furnace. Showing the striking of the electric flame.

The generating power at Notodden and Svaelgfos is produced at a cost of about 0·025 of 1d, which is rather less than Sir William Crooke's estimate of 1-17 of 1d. The quality of the nitrate of lime is quite equal to that of Chilian saltpetre; and the Norwegian product can be manufactured at a cost of not more than one-half the price at which the Chilian article can be delivered at Hamburg or Christiana.

2. Manufacture of Calcium Cyanamide.

The Birkeland-Eyde calcium-nitrate process has not been allowed to remain in undisputed possession of the field. Another method of fixing nitrogen is the formation of a substance called cyanamide by the electric heating of calcium carbide in a stream of atmospheric nitrogen. Calcium cyanamide is manufactured from the same quality of carbide as is used in making acetylene gas. Pulverised carbide is charged into retorts mounted in a furnace, and nitrogen is passed over the carbide. When the carbide is saturated with nitrogen the cyanamide is extracted in the form of a hard cake. After being cooled this substance is pulverised, and is then ready for use. It is placed on the market under the name of Nitrolim. Sometimes it is called "Lime Nitrogen."

While its principal use is as a fertiliser to take the place of Chilian saltpetre, cyanamide is also used for making quite a variety of chemical products.



Electric Furnaces at Odda, for producing calcium cyanamide.
Illustration from *Nature*.

The energy required in the nitrogen-fixation process in the cyanamide form is stated to be only one-fifth that necessary for the Birkeland-Eyde nitrates. The industry was first started at Piano d'Orta in Central Italy, with an annual output of 4,000 tons, which has, however, recently been increased to 10,000 tons. Other factories are being established in Italy and Austria. At Almissa, in the latter country, an installation giving 50,000 horse-power is in course of erection, with an annual capacity for an output of about 18,750 tons. At Notre Dame de Briancon, in France, there are works with an annual production of 4,000 tons ; and at Westeregeln and Bruhl, on the German Rhine, 10,000 tons are produced. At Bruhl steam power is used on account of the cheapness of coal. At the Niagara Falls the American Cyanamide Company are building a factory with a capacity for 6,000 tons, to be later on enlarged for an output of 40,000 tons. The Cyanamide Works at Odda, in Norway, are the enterprise of a British company, which treats about the same quantity of nitrogen as the Birkeland-Eyde nitrate works at Notodden. At the close of this year they expect to be treating at the rate of 45,000 tons of nitrogen, and to still further increase it next year.

In sandy soils, poor in lime, nitrolim is said to be unsuitable ; lime has to be added. With other soils it is generally satisfactory.

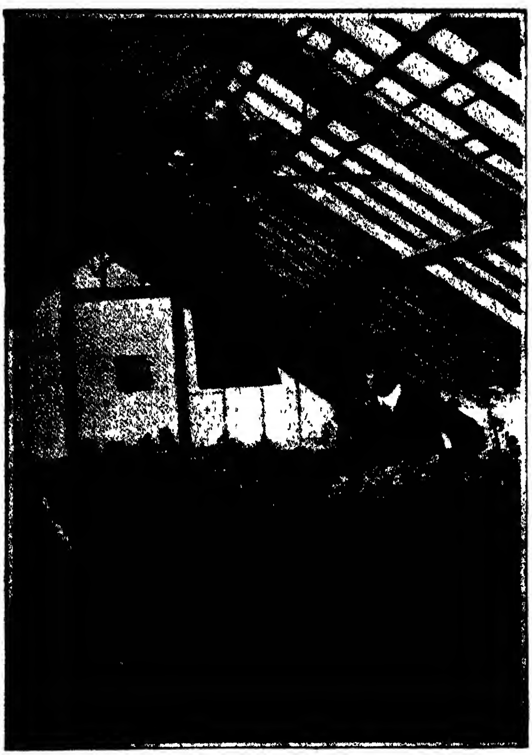
3. Depletion of Chilian Saltpetre fields.

Less than sixty years ago the output of Chilian saltpetre was only 25,000 tons per annum ; the production during 1906 was 1,500,000 tons, and during 1907 the quantity exported was 1,740,000 tons. Various authorities estimate that even at the present rate of consumption the supply will run out in from sixteen to forty-eight years. In view therefore of the depletion of the existing sources while there is an ever-increasing demand, the necessity for the establishment of the new industries is sufficiently apparent.

In connection with the question of nitrogen supply the potentialities of leguminous crops in rotation with grain, such as lucerne, clover, cowpeas, tares, peas and beans, are not overlooked. This system of culture is strongly advocated, but it could not be as extensive as the foregoing. General resort to it would inevitably reduce the grain area.

4. Thwaite System of Electro-culture.

Not only indirectly is electricity a valuable aid to agriculture, as in the manufacture of atmospheric nitrates, but it has now been satisfactorily demonstrated that the direct application of the rays of electric light has a powerful and beneficial effect in stimulating and accelerating the growth of plants. This fact was known immediately after the invention of the electric arc by Jablockhoff, and nearly thirty years ago Sir William Siemens in England made conclusive tests in this direction. Well-developed strawberries of excellent flavour were exhibited by him at a meeting of the Royal Society in 1880. Berthelot in France, Lemstrom in Sweden, and Bailey in America, prosecuted further investigations of a similar nature with satisfactory results.



Thwaite Electro-Culture System – Rear Side of the Arc Light.
From *The Scientific American.*

But it remained for the experiments now being carried out at the Royal Botanic Gardens in London to solve more completely the problems of plant-growing under electric light, by means of what is known as the Thwaite system of electro-culture.

The necessary agents in this system are (1) an ample supply of violet or chemically active rays, projected from powerful and moving arc lamps; (2) a supply of electrostatic current for the atmosphere and the plant roots; (3) the plant environment of an atmosphere containing moisture and carbon dioxide, in the proportion common to fertile countries, and a temperature ranging from 70 to 80 degrees Fahr.; (4) an ideal fertilising agent; and (5) an ample supply of water for the roots.

The apparatus employed to fulfil these conditions is installed in an ordinary glass-house, and consists of a suction power gas plant, the engine of which is

The larger plants were stimulated into a vigorous growth by electric rays, under the Thwaite System at the Royal Botanic Gardens.—Illustration from *The Scientific American.*

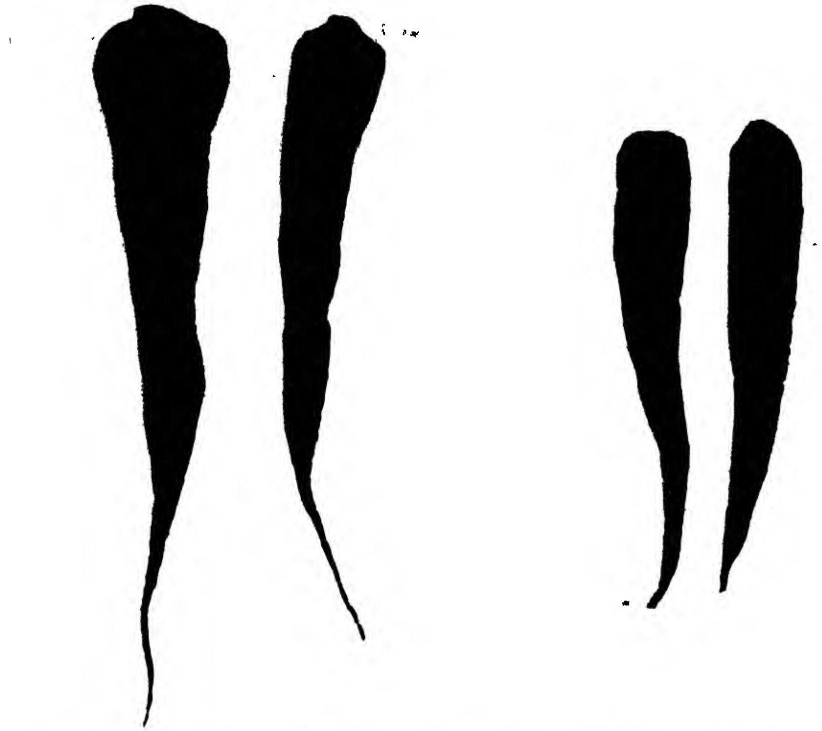
connected with a dynamo, from whence the electric current is conveyed to the travelling arc lamp. An electrostatic machine, which charges the atmosphere, the plant and roots, is driven from the gas-engine crank shaft; in fact, the whole requirements of heating, feeding, and lighting are supplied by the gas-engine.

Excellent results have been obtained both with vegetables and flowers, and from three to four seasons are attainable during the year.

In regard to the cost of working a glass-house under the Thwaite system, apart from the initial outlay it is said to be absurdly low; indeed, it is asserted that the whole expense of the apparatus and its working is about one-third that of the ordinary glass-house process.

Similar experiments to those of Mr. Thwaite have been made with a variety of plants at the Cornell University Agricultural Station in America. These have shown that the system does not benefit all plants equally, but that in regard to method of treatment they must be considered individually, and classified accordingly. The cauliflower proved absolutely unresponsive to the new stimulus under the conditions in this test; while from the lettuce most striking results were obtained, plants of the best quality being ready for market ten days earlier than by the ordinary glass-house process.

That electric light is a valuable aid in forcing and perfecting both market garden and horticultural produce is so far recognised that many American gardeners have already found its introduction distinctly profitable.



Carrots: The two larger were grown with electric stimulus at the roots; the other two under ordinary conditions.—From *The World's Work.*

5. Radio-culture.

Another problem which the Thwaite's and similar experiments throw considerable light upon is the effect of colour rays. While red rays stimulate growth very powerfully, blue rays have a marked retarding effect. For the horticulturist whose greatest trouble is the fluctuation of the market this discovery may prove of great advantage. Valuable plants about to blossom at an unprofitable time can be transferred to the blue-ray house, and retarded for perhaps several weeks until a more favourable opportunity for disposal arises. In order to bring about either the retarding or forcing result, all that is necessary is to furnish the arc lamp with a screen of the required colour. Probably the retarding colour would be more frequently used by floriculturists than the forcing agent.

Effect of colour rays on young Oak-trees. Both plants are the same age; that on the left showing fuller foliage and more vigorous growth, especially in the lower part, was grown under red light; the other under blue light.—From *The World's Work.*

Apart from the application of electricity, the study of radio-culture, or plant-growing under coloured glass, has occupied considerable attention for many years past. Very interesting experiments have been conducted at the Station de Climatologie Agricole de Jaivisy, mainly with red, blue, and green glass. It has been found that not only was development and growth affected, but that a change in the form of both flowers and leaves is possible. The Sensitive Plant (*Mimosa pudica*) sank into a state of suspended animation under the blue light; in the control house, where plants were kept for comparison under ordinary conditions, it had increased fourfold in height; in the green-house sixfold; while under the red light it had attained gigantic proportions, having increased in stature fifteen-fold. Under this colour the natural sensitiveness of the plant was so abnormally intensified that the slightest touch or breath sufficed to make it instantly droop its stem and fold its leaves; in the green light the sensitiveness was practically unchanged; while under the blue light the plant had become as stolid and as tough as a cabbage.

It is therefore apparent that although radio-culture has scarcely emerged from the experimental or suggestive stage, an expansive outcome lies before it; and as coloured glass-houses are 50 per cent. more costly than ordinary glass-houses, an adaptation of the colour screens to the Thwaite electro-system in ordinary glass-houses is bound to receive more attention.

6. Professor Lemstrom's Experiments.

While the Thwaite experiments consist of the application of both rays and current, and are confined to vegetables and flowers in glass-houses, those of Lemstrom are of a different character. They are open-field experiments, in which only the current is applied, and rays form no part. In 1902 and 1903 Lemstrom carried out experiments at Newcastle in England, at Breslau in Germany, and at Atvidaberg in Sweden, and remarkable results were obtained. Strawberries under this treatment showed an increase of from 50 to 128 per cent., corn from 35 to 40, potatoes 20, and beet 26 per cent. Lemstrom came to the conclusion that an all-round increase of 45 per cent. over normal crops on land of ordinary fertility might be reckoned upon.

His method was a wire net stretched across the field a little above the surface. From a machine stationed in a building outside the field an electric current was made to traverse the net. Occasionally it was necessary to raise the net, as it must not be allowed to touch the plants. The current does not act during rain, and its application to the plants during brilliant sunshine was found to be injurious.

The cause of the improvement effected is somewhat conjectural, but probably on the one hand ozone and nitric compounds beneficial to the plants are produced by the positive current passing from the points of the wire net to the earth; while, on the other hand, the negative electricity passing from the earth to the points of the net stimulates growth by drawing up the sap from the roots.

In regard to the commercial side of the question, Professor Lemstrom takes for an example a 25-acre field of wheat. He puts the initial cost of the apparatus at £108, and the annual upkeep at £23. The increased yield of 45 per cent. in the first crop pays not only the upkeep, but two-fifths of the initial outlay. On larger areas the profit would be much greater, inasmuch as the cost of working does not increase in the same ratio. Four years have passed since Lemstrom published these particulars, and as there is considerable modification in the system now in use in England by Sir Oliver Lodge, and decreased expense is usually the natural accompaniment of scientific advance, further information as to the cost of the later system is awaited with considerable interest.

It was as the result of years of study in connection with his polar region voyages of research, in which he realised that the greatest plant activity was concurrent with the periods of greatest auroral vividness, that Lemstrom was led to the conclusion that electricity must be reckoned among the principal factors of plant life.

It is said to have been demonstrated that the use of electrified seeds not only produces a larger quantity of successful plants, but that a greater proportion germinate.

7. Utilising Atmospheric Electricity.

So far back as the year 1746 a Scotch scientist named Maimbray made experiments on the influence of atmospheric electricity on myrtle trees, and in a paper read last year before the Bristol Naturalists' Society, reference was made to the mode of applying electricity to plants employed by a French ecclesiastical scientist, the Abbe Berthelon, in 1783. He used an apparatus for concentrating atmospheric electrical discharge upon plants, and demonstrated an improvement in the appearance of vegetation, and in the fertility of the plants. Contrariwise, Grandeau, in 1879, protected plants from the atmospheric electric influence, and showed that development was thereby greatly retarded. Coming to the present day, Professor Berthelot, in his experiments at the Mendon Agricultural Chemistry Station, compared the growth of plants at the top of a tower nearly 100 feet high with that of plants at the foot of the tower, and concluded that the greater growth at the higher level was largely due to the potential gradient in the atmosphere.

French scientists have directed their attention particularly to this question of utilising atmospheric electricity, with successful results. The system is to set up a *geomagnetifere*—or kind of lightning conductor—in the centre of a field, and to connect with it a network of wires running through the soil. One trial of this kind showed an increase of 50 per cent. in a potato crop, while the improvement was still greater in the case of tomatoes, peas, and other plants.

8. Preliminary Experiments of the U.S.A. Agriculture Department.

Experiments in electro-culture are being made by the United States Department of Agriculture, in order to determine whether any increased yield or hastening of maturity results from such treatment. The investigations

are being conducted mainly with the object of enabling the Department to answer inquiries for information, rather than with the view of establishing systems of commercial utility. It is sought to protect market gardeners and others engaged in intensive culture from the unscrupulous representations of parties interested in the sale of electrical machines or patent rights. Field tests are now in operation at the Arlington Experiment Farm. The system differs from that of Lemstrom's wire-netting arrangement. Instead of being just above the surface, the network is supported on insulators 7 feet above the ground. The network is heavily charged for several hours each day by means of a mica plate electrostatic machine. Areas on each side, not under the network, serve as controls or checks. In the last annual report of the Department, published last April, it is stated that the experiments have not yet progressed sufficiently for a definite report thereon. Experiments on a tobacco crop, by means of an electric current passed through the soil, brought no advantage to the crop. As before remarked, experience everywhere seems to establish the fact that all plants do not respond to the same treatment. In regard to the cabbage and several other plants, Lemstrom explains that this inequality was found to arise from an insufficiency of water.

9. Sir Oliver Lodge's Experiments.

In the experiments which are being conducted by Sir Oliver Lodge, Principal of the Birmingham University, the current is also sufficiently overhead to admit of the free working of the crops by horses and vehicles; and the system differs from that of Lemstrom, in having no close network. Wires are stretched across the field on poles. The generating power required is small; a two horse-power oil engine, driving a small dynamo in an outhouse, gives sufficient current to fertilise an area of 18 acres. The current is thrown off by the main wires and cross wires, and is absorbed by the plants. Anyone walking beneath the wires can feel the effect on the hair of the head, and on the face.

In the wheat area experimented on by Sir Oliver, the effects were visible from a very early stage. The plants were of a darker green, the stalk was superior, and gave a straw from 4 to 8 inches higher than that on the check area. In the case of Canadian Red Fife, the yield of grain was 35½ bushels, as compared with 25½ on the check area, an improvement of nearly 40 per cent. In the English variety the improvement was not so pronounced, being about 30 per cent. The produce of the electrified area sold in the market 7½ per cent. higher than the other, and the bakers reported it a better flour.

Notwithstanding all the evidence in its favour, it is, perhaps, somewhat early to accept electro-culture as a complete commercial success: but more than sufficient has been demonstrated to justify the matter being taken up in Australia. With our abundance of sunlight it may not appeal to us as strongly as to those in duller climates, but in one or other of its various forms it is surely worthy of our serious attention. Already some attempts have been made in Australia, particulars of which are now given.

All who are interested in the closer study of this important subject of the utilisation of the electric current in the agricultural and horticultural industries are recommended to obtain a copy of Professor Lemstrom's "Electricity in Agriculture and Horticulture," a handy little volume of 72 pages, published by the Electrician Printing and Publishing Company, Ltd., Fleet-street, London. Further details in connection with the experiments dealt with in this article will also be found in *The World's Work* of October, 1907, and April 1908; in *Nature* of July 23, 1908; in the *Fortnightly Review* of April, 1908; in the *Scientific American* of October 19, 1907, and February 22, 1908; and in the *Electrical Engineer* of July 24, 1908. The latter is a contribution from the pen of Sir Oliver Lodge.

10. Preliminary Experiments at the Hawkesbury Agricultural College.

At the Hawkesbury Agricultural College, Professor Lemstrom's experiments, as set forth in his book on "Electricity in Agriculture and Horticulture," have for some time been a matter of study; but in the absence of his apparatus, it did not seem practical to apply the tests. Recent developments reported, however, led to some interesting laboratory tests in the shape of pot experiments. Subsequently, attention was drawn to some results obtained from treating wheat with a high intensity current while in a solution of copper sulphate, and seed has since been subjected to this treatment at the College and planted out in the experimental plots. Framed samples of wheat plants, showing a great improvement in stooling and in general vigour, are on view in the visitors' room. Further pot and field experiments are now in progress, with the object of testing the correctness or otherwise of the first laboratory experiments, but under conditions somewhat more varied. When there have been sufficient repetition trials, definite conclusions will be arrived at and made public.

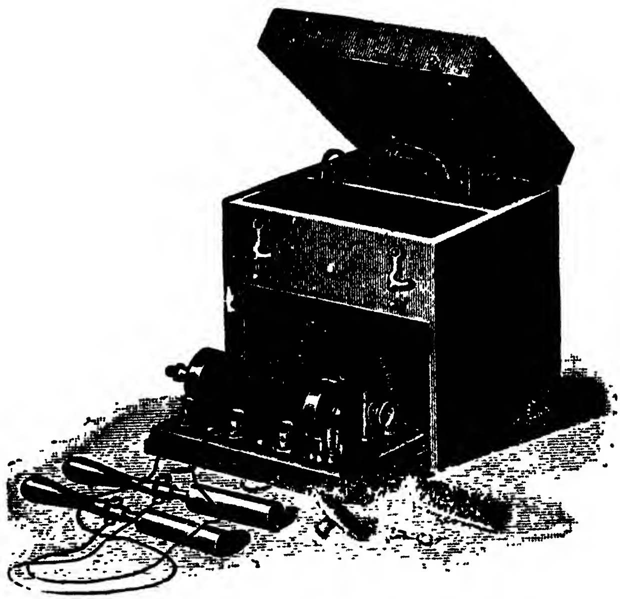
With regard to the more extensive experiments in connection with the direct application of the electric current to wheat fields, further details of Sir Oliver Lodge's tests, and the arrival of the necessary plant for carrying out this kind of work, are being awaited, and, as soon as possible, it is proposed to treat an area of about 10 acres.

11. South Australian Experiments with Electrified Seed.

Experiments with electrified seed have also been made in South Australia, near Yorketown, in the Yorke Peninsula, by the late Mr. George Butterfield, and the results have been made public in a paper read at a meeting of the local branch of the Agricultural Bureau. It should be stated that unsuccessful attempts at the direct application of current to the soil had been made. The seed to which electric current had been applied during from three to five minutes, in various degrees of strength, was then sown in different pots, while in one pot untreated seed was planted for comparison. There was an improvement reported in the plants from the electrified seed ranging from 55 to 80 per cent. This encouraged Mr. Butterfield to make an extended field trial. From one plot planted with seed electrified with the

full strength of the machine for five minutes, a result at the rate of 20 bushels 44 lb. per acre was obtained; from another plot, planted with seed electrified to one-half the full strength for five minutes, the result was 18 bushels 40 lb. per acre; while on a check plot sown in the ordinary way, the yield was 16 bushels 10 lb. per acre.

Mr. Butterfield did not live to continue his experiments, but they were followed up by Mr. Charles Barclay, of Corney Point, who is stated to have increased his own yield with treated seed on 60 acres by fully 40 per cent. Strangely enough, though he is reported to have treated his whole crop in the following year, no particulars of the result appear to have been made available.



Medical Coil Set; as used in the South Australian seed-electrifying experiments.—From block by Anthony Hordern & Sons, Sydney.

The machine used for applying the current to the steeped seed appears to have been an ordinary medical coil set, such as is used for rheumatism, and costing from £2 to £3.

Other experiments have been made at Werris Creek, in this State, by a farmer, who is reported to have obtained very satisfactory results from various plants, the seeds of which had been electrically treated.

12. Question of Nitrogen-fixing Industries in Australia.

In regard to the practicability of establishing atmospheric nitrogen-fixing industries in Australia, we certainly have not the extent of water-power like that employed in Scandinavia, Germany, Italy, America, and other countries with great waterfalls. Nevertheless it need not be concluded that we are destitute of the means of obtaining the necessary power. It is held by some that even in the hydro form available power might be obtained from the Barron Falls, the Tully River Falls, and the Wallaman Falls near Ingham, in Northern Queensland. The question is whether the falls are of sufficient permanence; and in this connection the representations, pictorial or otherwise, which we are accustomed to, are published more with the idea of attracting tourists to the district. What amount of power could be obtained therefrom would require careful consideration.

Block kindly lent by Mr. J. M. McNaught, Manager of the Advertising Branch, Queensland Railways.

However when people are prepared to venture their capital in an enterprise we may ordinarily assume that the prospects are enticing, and in regard to the Barron Falls it is well known that a company is at the present time desirous of acquiring the Falls for power purposes. About seven years ago, when the Dawson Government came into power, it was discovered that an agreement of this nature had been almost concluded by the previous administration. The new Government being adverse to it the negotiations lapsed. The power is not exactly claimed to be available to the full extent desired in

the natural state of the Falls; certain deviations would be necessary, and public feeling was against the project on the ground of spoiling or detracting from the original beauty of the place.

In connection with similar power available in New South Wales, it will be remembered that over ten years ago a scheme was seriously considered for the purpose of lighting Sydney by electricity by means of power from the Colo Falls on the Grose River. Though not deemed sufficient for so big an enterprise it is quite evident that a vast amount of power is obtainable from this source. Another source is the Snowy River. In a recent leading article the Sydney ***Bulletin*** says, "There are scores or rather hundreds of places on the Snowy, both above and below the (Dalgety) capital site* where turbines could be erected, and unlimited power transmitted."

It has been suggested that it might be practicable to harness our North Coast tidal rivers, which have a rapider current, and consequently a stronger force than those further south, with the object of wresting power therefrom for industrial purposes. It is by some objected that the cost would be too great, but the matter deserves attention.

It is certain that a vast amount of energy which could be utilised for generating electricity goes to waste from our artesian bores. According to the latest available information published by the Bureau of Statistics there are fifty-eight completed Government flowing bores, with an annual output of about 9,600,000,000 gallons; and there are in addition over 250 private bores, the complete supply of which cannot be accurately stated. Such a diminution in the output of some of the bores has, however, lately been observed that a Commission has been suggested to investigate the matter.

The question of utilising the artesian bores for power has been raised by others, quite recently by Mr. Symmonds, of the Chemist's Branch of this Department, who is conducting the nitric acid experiments on the soil at the Moree Irrigation Farm. The problem of using the bore-water for both watering and power purposes, however, presents serious difficulties. But whatever threshing out this demands, the subject has undoubtedly occupied serious attention from scientific and other able writers, amongst whom may be mentioned Prof. Mason in America, and Mr. Gibbons Cox, C.E., of our own State. Further information in this connection, as well as on one or two other points dealt with in this article, is given by Mr. Symmonds in Bulletin No. 12 of this Department, copies of which can be obtained free on application to the Under Secretary for Agriculture.

We have seen that the Cyanamide Works at Bruhl, in Germany, use steam-power on account of the cheapness of coal. This raises the point whether alongside our large collieries, with their vast quantities of refuse coal available as cheap fuel, such works could not be established in this State. There are several large coke-works where the refuse coal is treated, and here, too, a very large proportion of heat goes to waste which could be turned into steam power.

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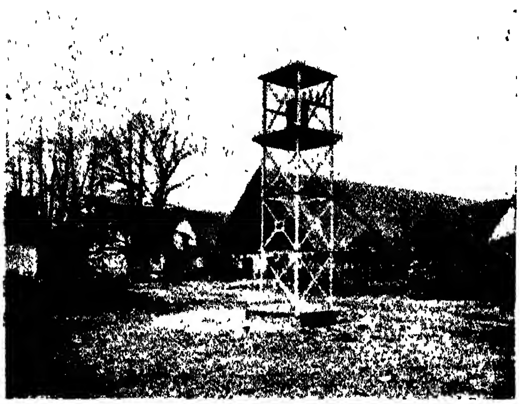
* Since rejected.

Possibly also the power of some of the big mining works might be turned to further account in generating electricity for this purpose, in which case it could probably be effected with very little addition to the staff.



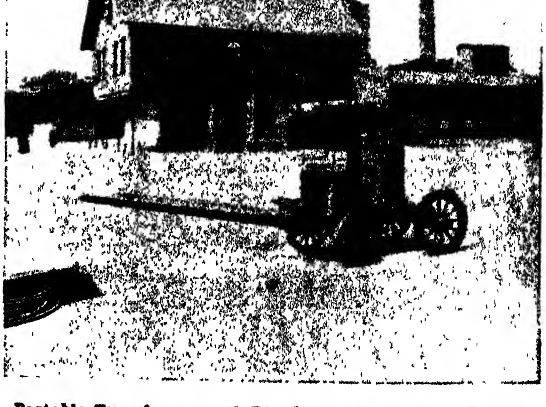
Stationary Transformer on a German farm, connected with a supply station. From this point the current is transmitted all over the farm.—From illustration kindly lent by Siemens Bros., Ltd.

Last, but not least, with the completion of the Barren Jack scheme, there are also vast possibilities for a grand system of generating electricity which could be utilised for various industries. As the recent decision of the Commonwealth Parliament makes it highly probable that the Australian capital will be in this district, additional interest and importance attaches hereto.

Wherever the power is, nitrogen is close at hand. It is calculated that over every 9 acres of the globe there are 280,000 tons of nitrogen, which is the quantity that would be necessary to produce the equivalent to the present output of Chilian saltpetre.

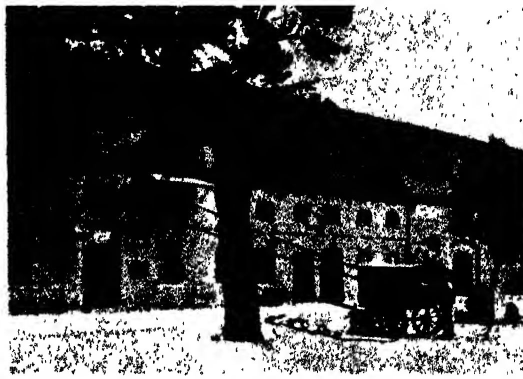
13. Electricity in Farm household life and field operations, in other Countries.

A notice of this kind would not be complete without some reference to the adaptation of electricity to farm-life, apart from its application to the soil. In America it has effected an agricultural revolution. The electric railway light lines have played a great part in this development. In a report on the subject of these lines most of the towns attribute great part of their progress to an increase of business from farms. Closer contact between town and farm is mutually advantageous, but it makes more in favour of the farm-house. As well as better and quicker transportation it means better social conditions, more frequent entertainment and amusement, and superior education.



Portable Transformer and Distributor on a German farm. Illustration by Siemens Bros., Ltd.

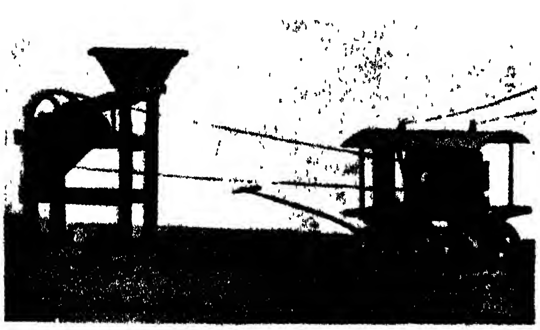
Next in importance is the farm-house telephone. In the United States the official weather forecast is communicated daily to every subscriber on the circuit. A few weeks ago we learned how warning of the approach of a disastrous flood was conveyed to the settlers by means of the telephone, and how the heroic operator lost her life while remaining at her post to complete her duty of communicating the dread intelligence.



Portable Motor connected with Chaff-cutter in a loft on a German farm.—Illustration by Siemens Bros., Ltd.

On a farm in New York State electricity generated from water-power saws timber, cuts up fodder, and lights the homestead and premises. At a summer hotel farm, 25 miles from New York, an electric plant drives washing machines, bails swampy pools, crushes stone, and does lighting and lifting for the hotel; it also works a bottle-washer, churn, cream-separator, butter-worker, can-scrubber, and ice-crusher.

Electric motors for farm travel and driving machinery, such as threshers, are said to be less expensive than steam-power. Two electrical companies in Kent and Gloucester (England) are pushing a business with the farmers. In the South of France, where water-power for generating the current is available, electrical farming is found to be profitable, and on the Continent generally they appear to be in advance of England and America in this respect. At Summern, a portable motor is attached to three machines and cuts up in one hour 1,430 lb. of carrots, crushes 1,100 lb. of linseed cake, and lifts water to the stables. Disconnected, it goes to the fields where it drives a threshing machine and a chaff-cutter. An electric plough used successfully near Turin, travels 1,000 feet in eight minutes, turning three furrows at a time, at a good depth.



Portable Motor attached to Winnower on a German farm. Illustration by Siemens Bros., Ltd.

In scientific farming pumping apparatus plays an important part. First we had the windmill pump; now the electric pump is the watering-pot of the south-west of the American States. Very frequently the windmill, gas, or other motor is now employed to generate the electricity. Land which formerly was of little or no value is now of

Portable Motor attached to Threshing Machine on a German farm.—Illustration by Siemens Bros., Ltd.

enormous value both for grazing purposes and for fruit-growing.

In this section several illustrations of electricity as applied to farm operations in Germany are from copies lent by Messrs. Siemens Bros., Ltd., London and Sydney. The extensive electric plant at the Hillgrove Mining Works, the power for which is carried from a water source 20 miles distant, was supplied by this firm.

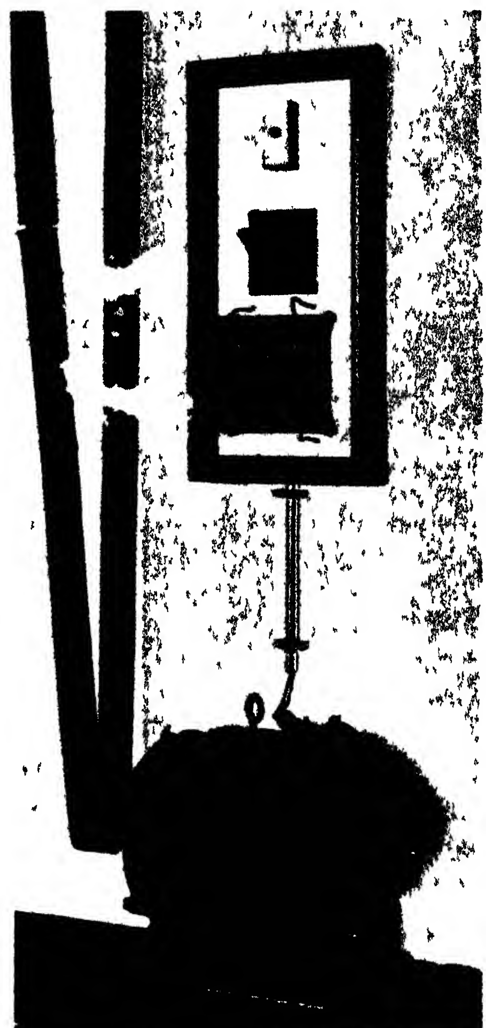
14. Electricity in Farm household life and field work, in Australia.

In Australia, electricity for illuminating or driving purposes is at present little used on farms or stations. In this State it has been installed on Sir Samuel McCaughey's homesteads at Yanko and at Coonong, in the Riverina; at Mr. R. J. Simpson's station, at Morduval, near Quirindi; at Mr. G. Binnie's station, near Quirindi, it is used for pumping as well as for lighting; on the estate of Mr. H. R. Denison, horse-breeder, near Guntawang, in the Mudgee district; at Tooma, in the Upper Murray district, for lighting and driving; at Butterbone Station, in the Warren district; at Werrina, near Mungindi; and at Conargo Station, in the Riverina.

At the Hawkesbury Agricultural College, Richmond, in addition to the whole of the premises being lighted by electricity, the current is also utilised as a motive power for numerous purposes. There is at the lighting station a storage battery, from which power is distributed to the motors in the dairy for separating milk, and driving churns, butter-workers, and pumps; in the feed-room there is an 8 horse-power motor for cracking maize, and another motor for shelling corn; a portable 8 horse-power motor used for cutting chaff at the haystacks reduces the risk of fire; silage is also cut by electricity; pumps at the septic tank driven by a motor raise 12,000 gallons of effluent daily a height of 24 feet; wood is cut by this power, and in the carpenter's

Plough worked to and fro in conjunction with two movable electric motors on a German farm.—Illustration by Siemens Bros., Ltd.

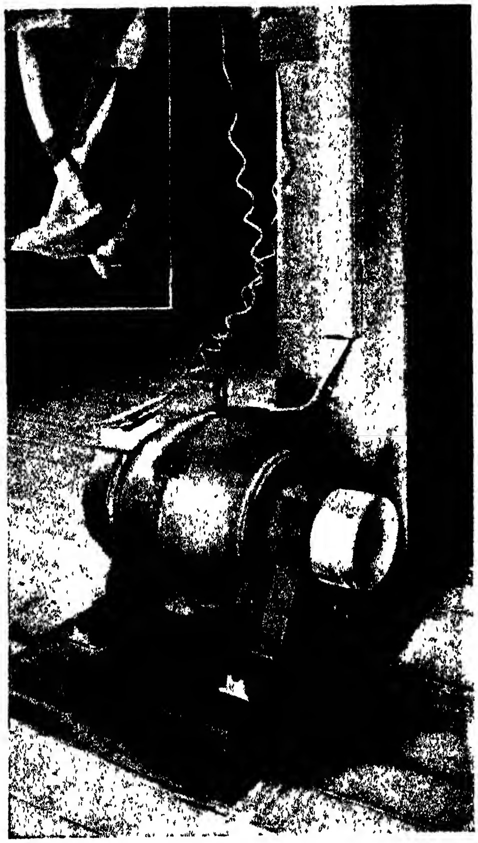
shop risk of fire amongst the shavings is avoided by heating the glue-pot by electricity; the laundry is fitted up with electric irons, and there are electric fans in the dining-room; in the chemical laboratory an electric motor developes gas for heating, and the centrefuge for soil analysis is driven by electricity; the lecture-room is heated by electric radiators, and electric light is used for the demonstration lanterns; in the poultry-yard the incubators are being made electrothermic.



Electric Motor working various appliances in the Dairy, at the Hawkesbury Agricultural College, Richmond, N.S.W.

In connection with the scheme for important irrigation works shortly to be established on a portion of the Hawkesbury College Farm, it has been decided that the pumping is to be effected by electric power. Additional machinery will be erected at the present lighting station to raise the pressure required to transmit the current to the pumping station.

The rapidity with which in this country electric power and light is being taken on in all directions, except in the agrarian industries, is remarkable; and we may confidently prophesy that, with the increasing perfection of this kind of plant, and with its superiority over the old systems, the conservative prejudice against its introduction by agriculturists and pastoralists wil[illegible] be overcom[illegible] ack to the [illegible] eral [illegible] compact oil-engine dy[illegible] prohibitive railway f[illegible] he feeding material. [illegible] on kerosene and other oil is [illegible] two and a half to three or [illegible] times that o[illegible] agricultural produce, according [illegible] the quantity and distance. This militates against the efforts of engineers and supplying firms to push a business in the rural districts. In respect to spirit as a motor fuel the regulations of our Distillation Act form another bar to the more general introduction of small power plant on farms. In Germany considerable latitude is given by the Government,



Electric Motor connected with corn-crusher, at the Hawkesbury Agricultural College, Richmond, N.S.W.

and as farmers are privileged to manufacture white spirit for power purposes, we find that alcohol engines are in very common use. The necessary spirit is distilled from potatoes, maize, and other substances. Every farmer with a small alcohol or other engine and dynamo can not only generate his own electricity for lighting, but by running wires and using small electric motors power can be supplied anywhere within a reasonable distance. With an accumulator the plant can be shut down and power be available independent of the generator.

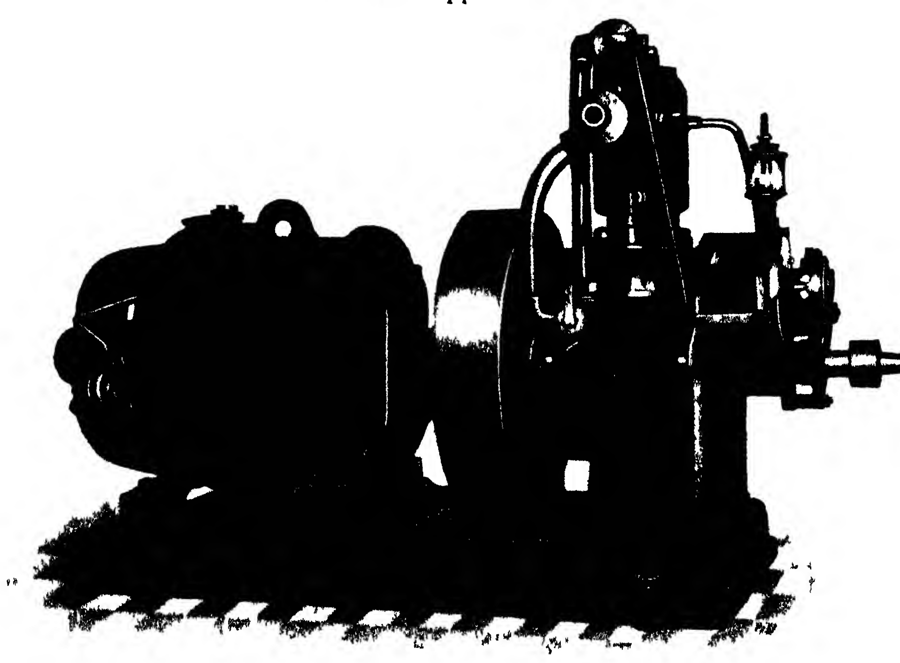
In the case of a suction-gas plant, either simple or with dynamo, charcoal can be used as fuel. The quantity required is very small, and most farmers could make their own supply. The majority of our Australian timbers are unequalled in their suitability for making charcoal The suction gas-plant is the class of engine previously referred to as being used in connection with the Thwaite electro-culture experiments at the Royal Botanic Gardens. As showing how it is regarded from an economical point of view, it may be

Small "Ruston" Suction Gas Plant, consisting of Gas Engine and Gas Producer; will work on small quantity of charcoal or coke.—From block kindly lent by Messrs. Gibson, Battle, & Co., Sydney.

mentioned that it has been recommended to substitute this kind of power at the works of the Hay Irrigation Trust. The small Ruston suction gas power plant illustrated in these pages is from a block supplied by Messrs. Gibson, Battle, & Co., Sydney; also the small oil engine with dynamo, which is capable of supplying eighty-two electric lights of 16-candle power each, and of being used as a 2-h.p. motor. The Mather-Platt electrical pumping plant for the Menangle Water Works, an interesting account of which appeared in the columns of the *Engineer*, was supplied by this firm.

"Mather & Platt" High-Lift Pump and Motor. From block kindly lent by Messrs. Gibson, Battle, & Co., Sydney.

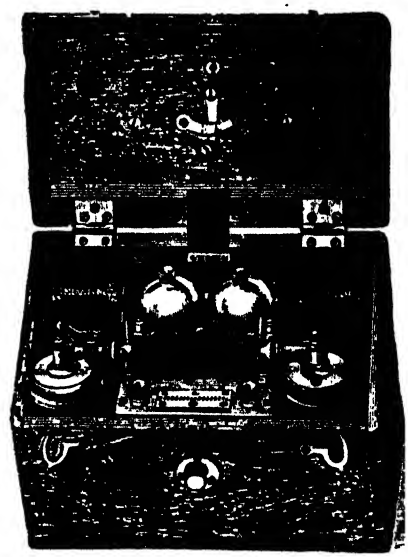
There is one phase of electricity as applied to agrarian life in this country, which has undoubtedly caught on with the farmer and grazier—that is, the introduction of the telephone. One firm alone—that of Anthony Hordern and Sons—do a business in farm and station telephones and material to the extent of fully £3,000 a year, with an increasing tendency. They have supplied extensive material for Brookong, Widgiewa, Cannonbar, Urangaline, Tarcoola, Coonong, Carrathool, Wilga Downs, Uardry, Groongal, Nangus, Cronga Peak, and other large stations in the interior, some of which have over twenty telephones connected; and a large number of smaller stations and farms have been supplied.



Oil Engine with Dynamo; for 82 electric lights, 16 c.p. each. From block kindly lent by Messrs. Gibson, Battle, & Co., Sydney.

A very useful apparatus is the portable telephone, fitted in a leather case with shoulder-strap, and carried on horseback or afoot. It is largely used by boundary riders and other station employees, who can thereby promptly report any urgent matter to the head station, or communicate with any part of the estate, by simply attaching it to a wire-fence, provided, of course, that the necessary connections have been made with this object in view.

1.



2.

Portable Farm and Station Telephone (1) for horseback; (2) for vehicle.
From blocks kindly lent by Messrs. Anthony Hordern and Sons, Sydney.

During the year 1906, the Telephone Branch of the Postal Department connected 347 farm and station telephones, and 554 during 1907. The total number connected with inland post-offices is now between 1,700 and 1,800. In addition to these, the number of private lines is very large. On the Central-Western Slope, the Narromine, Peak Hill, and Trundle district is a perfect network of telephone systems. The north-western district is also well supplied, and, as an illustration of the value of this means of communication, it may be mentioned that the postmaster operating at a small town in the Narrabri district was recently the recipient of a presentation in recognition of his services in frequently apprising the pastoralists and farmers in a large circuit of the rapid rising of the rivers, caused by rains higher up and over the Queensland border. The stock were quickly removed from the low-lying lands, and considerable loss averted. It reminds us of the more serious American incident previously mentioned.

As surely as the telephone is so rapidly becoming a necessary adjunct to farm and station life and operations, so we may safely predict that the day will come when, from electricity generated on the premises or from supply stations, not only will farm dwellings and other buildings be lighted, but numerous household and field operations will be worked by the same power; when the chaff-cutter and the sewing-machine will both be switched on.

A list of electrical engineering and supply firms in Sydney is given hereunder:—

Australian General Electric Co., Equitable Buildings, Sydney.

Crompton & Co., Ltd., 56 Margaret-street, Sydney.

Dick, Kerr, & Co., Ltd., 350 George-street, Sydney.

Edison and Swan United Electric Light Co., Ltd., 58 Clarence-street, Sydney.

Gibson, Battle, & Co. (Mather and Platt, Ltd., Manchester), 7 Bent-street, Sydney.

Hayes, Oswald, 2 Hunter-street, Sydney.

Hordern, Anthony, and Sons, Universal Providers, Brickfield Hill, Sydney. (Telephone and other electrical supplies.)

Hungerford, R. B., 165 Pitt-street.

India-rubber, Gutta-percha, and Telegraph Works, Ltd., 279 George-street.

Lawrence and Hanson, 55 York-street, Sydney.

Lohmann & Co., 9 Castlereagh-street, Sydney.

Noyes Bros., 109 Pitt-street, Sydney.

Siemens Bros., Ltd., 16 O'Connell-street, Sydney.

Warburton, Franki, & Co., 167 Clarence-street, Sydney.

NOTE ON *Amsinckia echinata*, A VERY BAD WEED.

J. H. MAIDEN.

THE following letter has been received:—"Per bearer, I hand you specimen of a weed which, for some two years past, has made its presence felt in wheat paddocks in the Yass district. It grows to a height of about 2 feet or more, and shoots out from one firm stem. It literally chokes the wheat, which is simply annihilated by the weed. Horses eat it with relish, and pigs will fight each other to get at it. I have been asked to ascertain if the weed is known to your Department, and, if so, the best means to have it eradicated (ploughing the ground seems to have failed in that direction); or you might be able to say whether it could be made into hay. Any information that you can furnish will be greatly appreciated. The specimen herewith was handed to me by Mr. Laurence Roche, of Nanangroe Station."

This is an American weed, with yellow flowers, belonging to the Borage Family, and named *Amsinckia echinata*, A. Gray. I know no common name for it, and it is not convenient to publish a plate of it just now.

It was first referred to in the *Gazette* for January, 1905, page 27, and May, page 430. It was first recorded from Blayney, and later from Wagga Wagga, so that it is surely spreading. It is getting a firm hold in the Yass district. The only way to deal with it is to eradicate it before it seeds. It is a profuse seed-bearer.

A Permanent Poultry Farm.

G. BRADSHAW.

Introduction.

In a series of articles on suburban poultry yards, of which this is the second, there is one condition which has been kept in view, viz., that each one dealt with should be of known stability. To those unacquainted with fowls and fowl-farming this provision may appear unnecessary, as farms of whatever sort, stock or crops, are considered to be established with the object of making a living and profit to those conducting them; and when farms are spoken of they are understood to be profitable, of permanence, and stability. From several causes it, unfortunately, is not so with farms devoted solely to fowls—not through the inability of hens to produce a reasonable profit, but rather to the undue booming which this branch of culture has, in the past, been subjected to, resulting every year in a large number of people without any experience going into the business, the larger percentage of them in one or two years abandoning it, and, in most cases, retiring with experience which had possibly cost them their entire capital.

It needs no gainsaying that in most businesses there are a proportion of failures each year. Such may be due to sickness of the owner, unfair competition, losses through bad debts, mismanagement, or a score of other things. Indeed, within the last dozen years, quite a number of people who had failed in other businesses personally consulted me on the subject of poultry-keeping, leaving the impression that they regarded it as a sort of refuge for the destitute. One case is illustrative of others, the only difference being that of degree. A widow lady, a new arrival in this country, who had possibly seen something in the papers about the profits from fowls, consulted me on the possibility of an investment of some £200 in poultry-farming, this being the entire amount then left of her husband's estate. She believed she had an intuition for managing poultry, but candidly admitted she had had no experience.

My advice was "Don't." However, she was one of those people who ask advice all round, then follow their own idea. Six months afterwards she brought a case of eggs to the Government cold stores, which was the first time I learned that she had invested all she had in a farm in a Sydney suburb. Three months after this it was in the market, and within twelve months from its inception it was sold, £75 being brought out of the place.

Within the following three years the farm had three tenants, all of whom lost more or less money. At the present time it is a going concern, small, but affording a living for those working it; for the simple reason

that they did not consider themselves born poultry-farmers, but commenced in a small way; had another occupation from which they made a living; gradually increasing their stock, thus gaining experience until the present time, when, with good, hard, constant work and long hours, they are making a living solely from the fowls.

I have had letters from numerous people in employment, but who desired an out-door life, asking about the possibilities from a poultry-farm; in one or two instances actually asking from how many fowls they could make a living. Such were always told that it all depends on what they call a living. Some people live on less than a £1 a week, while to others this amount would be starvation. Perhaps the most remarkable of these communications was that received a few months ago, and on a post card. It was dated from another State—a Melbourne suburb—and is certainly unique, as showing the ideas held by even well-informed people. The communication was as follows:—"In the interest of my health, I have been ordered to give up my present position in favour of an out-door life. Will you please inform me how much money is required to commence poultry-farming in your State; the best locality; and how to succeed?"

Here was a man who, probably, had served five years' apprenticeship to a business; was obliged to give it up, and really expected to become proficient in another one at the expense of a postage stamp. Of all businesses poultry-farming is one that cannot be taught by post.

Like instances are of regular occurrence. The widow of some city man, with a few hundred pounds, inquires as to the profits from fowls. At times the shopkeeper thinks the strain of over-keen competition is too much for him; the prosperous mechanic, and sometimes a newly-married couple with nothing definite about the future, have all thought of poultry-keeping, and in too many instances have indulged in it to satiation, *i.e.*, till their all was spent.

My point in introducing the above matters is to dispel some false notions about the poultry business, and to disabuse the mind of many erroneous ideas about it. To make a living from fowls only, *i.e.*, poultry-farming, requires a special education and personal knowledge more than any other business; and such can be acquired neither by post card or other correspondence, but by actual practice and experience. Reading even the best poultry literature available will not make up for the lack of personal knowledge of the many details necessary to success.

One other error should be pointed out. Those desirous of going in for poultry-farming frequently think it is a nice easy business; just the thing for a lady; nothing to do but throw the grain to the fowls and gather up the eggs; it being often forgotten that the corn has to be purchased, and that even on the best-regulated farms there are many times when the eggs gathered will not pay the feed bill.

Strictly speaking, poultry-farming is a twelve or fourteen hours a day work, and seven days in the week. Withal this, like other businesses,

has its successful votaries, the handicaps mentioned being discounted by the advantages of freedom from city worries, the out-door life so essential to health and a sound mind, together with the extreme of satisfaction in that individual human craving of being one's own master. These attributes, and the additional one of making a living by fowls, apply in every degree to the subject of this article, and safely warranting the compendious title of a Permanent Poultry Farm.

The Locality.

Commencing at Sydenham, the junction station of the Belmore and Illawarra line, and proceeding to the terminus of the former, and to Penshurst, on the latter, there is an extensive V-shaped country, containing many thousands of acres. Striking a circuitous route from Penshurst along Forest, Bond's, Belmore, and other roads, a good idea of the original state of the big expanse of country can be realised. The evidence shows that the district had been sparsely settled on in early days, the commercial object being the massive ironbark and other eucalypts; the best of these yielded to the pioneer's axe.

Population increased; the later generation doing well out of the leavings of the early timber-getter. An attempt had been made at farming, and the remains of abandoned orchards implies that, even in the days prior to the advent of the fruit-fly, there were more remunerative means of making a living than by fruit-growing.

Although the settlement in the district gradually increased, it was the extension of the Suburban line beyond Hurstville and the opening of the Sydenham-Belmore line which really brought population to the place. The immense forest with its occasional homestead and extensive area of bush is now largely open country, with hundreds of comfortable dwellings, to which are attached from 10 to 50 or more acres, and in the majority of instances owned by the occupiers. Fruit-growing to a small extent has been entered on. The principal operations are, however, market gardening; there being hundreds of acres of cabbages, peas, and like crops successfully cultivated for the Sydney markets.

Pig-keeping and poultry-farming are also largely carried on; the methods which contribute to the success of one of the latter places being the object of this paper.

Belmore-road, Belmore, is the address of the farm under notice—train to Penshurst being the first stage of the journey. From here the next instalment of the passage is by coach, *viâ* Forest-road to Peakhurst, a distance of some 3 miles. The passengers alight at the Peakhurst Public School, a walk of 2 miles further, *viâ* Bond's and Belmore Roads, brings one to the farm of Mr. D. E. Staples.

The Farm.

The owner of the farm was originally a pig and duck farmer. These sections usually go together in the Sydney suburbs, chiefly from the fact

that ducks are gross feeders, and not so particular as to quality as fowls; Glebe Island and other offal, hotel and restaurant waste, and varied bulky cheap foods being most suitable.

Mr. Staples commenced the above business some twelve or fourteen years ago, and made a success of it, but gave them up in favour of fowls, and, except a sojourn in South Africa, has been engaged in the business to the present day.

The farm, like many others in the neighbourhood, consists of about 10 acres, and no doubt is a section of the subdivision of some of the big forest.

Mr. Staples, being a practical man and knowing exactly the requirements of fowls and the conditions of this country, did not take the advice of the poultry books to select a high and dry aspect, with a slope to some point of the compass. The fact is that Australian conditions are such that, rather than the dry elevation, the chief trouble to poultrymen is over-dryness. In England, with weeks of continuous rain and little sunshine, the high and dry situation is important, but conditions here are altogether different. We get our rain on but a few days in the year and the results quickly disappear. Indeed, often, even on a poultry farm, the dust will be blowing off the place the day following a 2 or 3 inch rainfall.

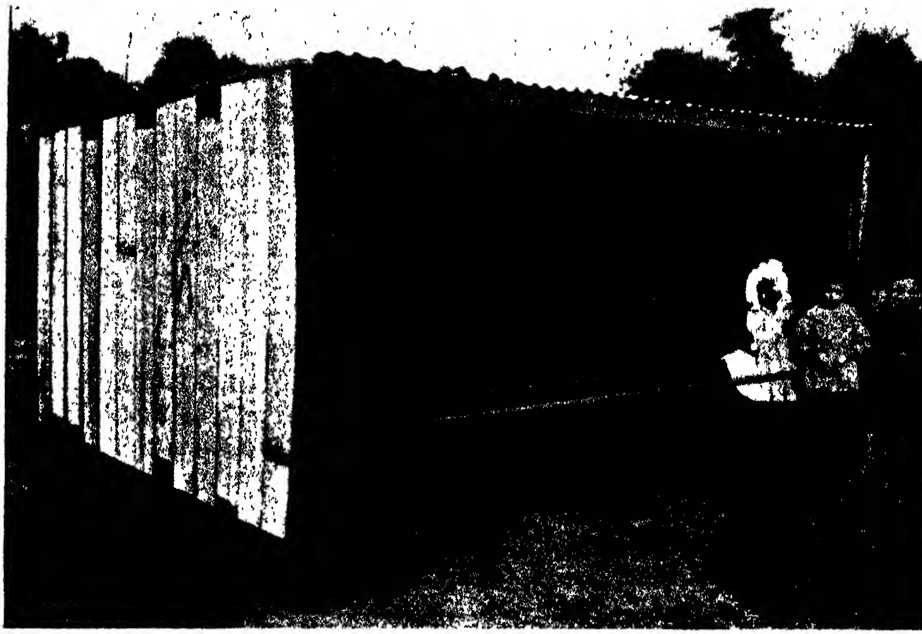
The 10 acres constituting the farm is flat, neither is it on a hill, and had the site been any other place, there is scarcely a doubt but the results under the present owner would have been the same as before described, viz., a permanent poultry farm.

The Runs, Houses, etc.

The principal operations to the end of profit is egg-laying, and for this purpose 7 or 8 acres are wire-netted into large runs.

As previously mentioned the heavy timber had been removed many years ago, the present state of the farm being a further growth of gum-tree saplings, reaching from 12 to 30 feet high, and from these the many gates, posts, and other woodwork of the farm are made.

Some of the houses are also made from the wood on the farm; in others second-hand timber and iron have been utilised. The hinges of the many gates and doors, fastenings, and other appurtenances connected with the business are all home made. Indeed, from a cursory glance, the wire-netting excepted, the bulk of the material to accommodate several thousand fowls was obtained on the place. The houses are the open-fronted ones, long since advocated in the *Agricultural Gazette*. The illustration shows one of these, a plain structure measuring about 15 feet long, 8 feet high in front, sloping to 7 feet at back, with a depth from front to back sufficient to allow five rows of perches, and capable of accommodating 120 to 150 fowls. In keeping with the inexpensive constructions, the water vessels are those advocated in the *Gazette*, namely, kerosene

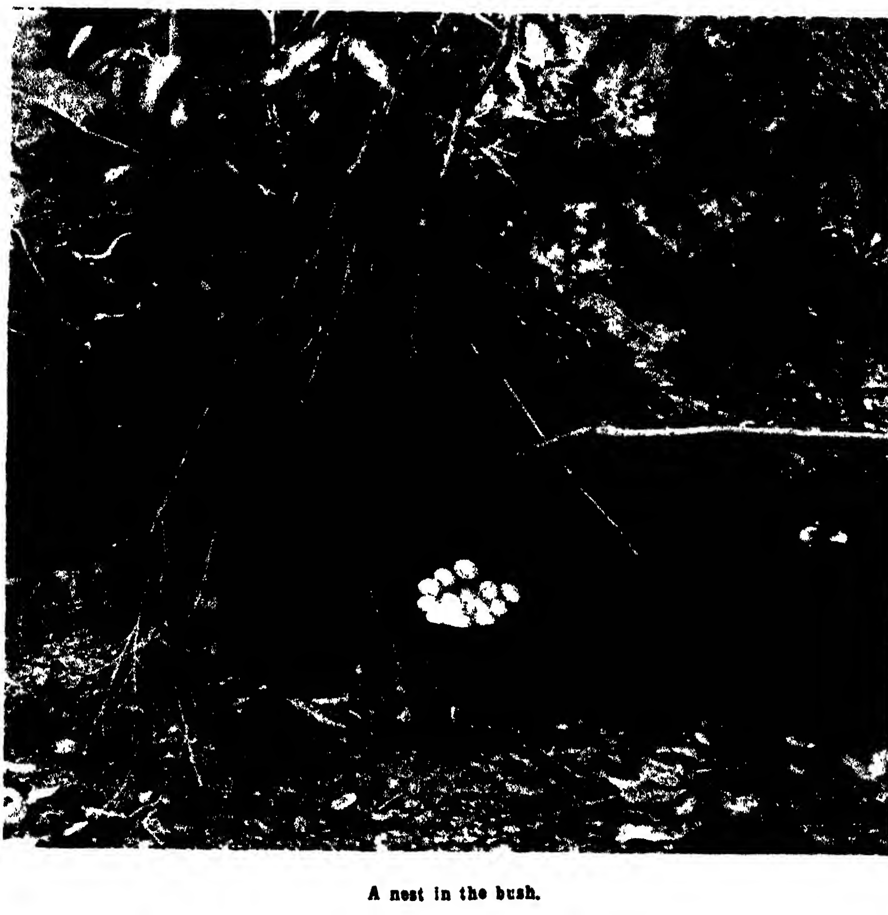


An open-fronted poultry house.

A small poultry house.

tins. These cut diagonally make two excellent water vessels capable of holding 2 gallons. But however cheap the above appliances and fittings are, the nest boxes are more so.

The farm, irrespective of the eucalypts, is covered with a thick native scrub, and every few yards one goes through the large runs a nest of eggs, containing from one to twenty, can be seen in the centre of a bush. One of these is shown, not exactly in its natural state, as the bush had to be removed in front, and others bent down to facilitate the camera's



A nest in the bush.

operations. Where a nest has been selected by the hens in a scanty scrub, a board, or portion of a sheet of iron, is bent over the nest to keep the sun's rays from the eggs; although this is scarcely necessary, as all the eggs are infertile, there being no male birds kept with the layers.

Despite the fact of there being ample roosting-houses in every run, quite a number of the hens roost in the branches of the trees, and, for the entire laying period, have never been under cover. Withal this, every hen on the farm looked the picture of health.

Hatching.

The hatching is done on this farm mostly by incubators. The owner says he cannot afford the hen's time to hatch and rear chickens, as it pays him best to keep them laying.

When any become broody, a few days is sufficient to cure them, and they usually commence to lay again in ten or twelve days. There is the further fact that those who use hens have occasional ones which leave the nest before the hatch comes off, the whole setting and time of the hen being thus lost. The incubator-hatched chickens have the advantage of commencing life with a complete freedom from vermin, which is the great bane of chickenhood. The foster-mothers are all home made, simple, and effective.

A breeding pen of White Leghorns.

Feeding and Rearing.

"When the chickens are hatched I do not trouble with any of the fancy mixtures," said the proprietor. "On a farm where one has to make a living from fowls there is no time for these special foods. Chicken mixtures are, no doubt, all right, but when I can rear 95 per cent. of those hatched on bran and pollard made into a crumbly state, what need is there to change for foods more expensive? I commence the newly-hatched chickens on bran and pollard, made into a crumbly state, with hot water. This I alternate with cracked wheat. With this plain, simple feeding they thrive well, and when the cockerels get as much as they will eat, they are in fit condition for the market at four or five months, while the pullets, through not being forced, are well constituted for a twelve months' laying."

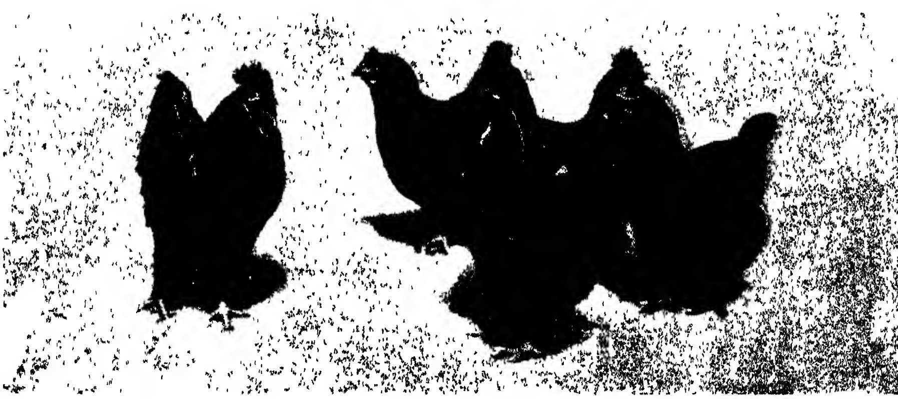
Feeding the Layers.

"The layers are also simply fed, b[illegible]d rule, weather conditions governing the meals, while at other times a certain food may run out, and they have just to take whatever is available. Pollard and bran, with cut green stuff, and meat three times a week is the usual morning feed:

cut green stuff mid-day and wheat at night. The food is varied throughout the year, cooked vegetables such as beet, cabbage, and other like stuff I occasionally mix with the bran and pollard in winter, while maize and oats often take the place of wheat. Cut bones are sometimes given, while cut barley, rye, oats, lucerne, or other green stuff, all grown on the farm, is supplied daily all the year round."

Breeding for Layers.

It has often been said that the show type and the laying type of fowl cannot be found in the same specimen. Mr. Staples's large flocks of Orpingtons and Leghorns disprove this statement, for in both breeds there are scores of birds that would secure a place in any show-pen; many of the Leghorn pullets, now from 10 to 12 months' old, weigh from 5½ to 6½ lb. each; and although I did not see any Orpingtons scaled, the bulk of them were heavyweights, and true to type. Questioned as to how this



A breeding pen of Orpingtons.

size was secured, Mr. Staples' reply was: "To secure 1,000 or 1,500 layers requires some hatching, and 1,000 good layers are always better than 1,500 bad ones. They eat very little more food and require less attention. If my stock only averaged 100 or 120 eggs for each hen, the farm would never pay me. The average of the entire flock is about 185 to 195 per hen, although many of them lay considerably over 200 eggs each. My system is to put up several pens of pullets, and keep them there for twelve months. I keep a score card in the pen and record their eggs each day. I soon find out those that lay best and lay the largest eggs, and breed from these only the following year. The great size of my Leghorns I attribute to this selection of the largest eggs, for large eggs invariably hatch a large c[illegible] and a chicken which is large of its breed when hatched generally grows into a large hen. After 2 years of age, as layers, I dispose of them, as all profit is had from them by that time. I only keep Black Orpingtons, White Leghorns, and a few Silver

Wyandottes. All are bred big and lay big eggs, which top the market every time, and as I market from 200 up to 300 dozens weekly, a 1d. per dozen advance would be a £1 a week. Then when they have done laying eggs they make splendid table birds; the three breeds have all fetched me as high as 6s. 6d. per pair for killing purposes. There is not much difference between the laying of the three breeds, still I think the Leghorns do best with me."

The illustrations of the breeding-pens show the type and size as mentioned above, while those in the larger flocks are illustrative of the general stock of the farm.

A mixed assembly.

Ducks.

In an earlier portion of this article it was stated that Mr. Staples had given up pigs and ducks in favour of hens only; however, two or three years ago there was so much written about the wonderful laying of Indian Runner ducks, a number were secured. Although not up to expectations they are to be given another year's trial, and if found not to be worth keeping, they will have to go.

At present they are laying well, and the high price of ducks in the market is in their favour. A few years ago old ones of this breed fetched as low as 2s. 6d. per couple, now 5s. 6d. is the current rate. The illustration of the Runners show them to be of the correct type, whilst that of the six weeks' old duckling is sufficient warrant that they are good thrivers.

The ducklings are fed like the chickens, on bran and pollard mixed with hot water. They are kept out of any rain, given plenty of drinking

A pen of layers.

Indian Runner ducks, six weeks old.

water, but not allowed to get into any; grit and plenty of green food, with some meat, complete their ration until marketing time. Incubators and Muscovy ducks are both used in hatching.

Marketing.

Mr. Staples is a shareholder and one of the Directors of the Poultry Farmers' Co-operative Society, and, naturally, markets his stuff there.

In breeding, to get 1,500 pullets each year entails double that number of chickens to be reared, as, approximately, the half of them will be cockerels which have to be sold. Mr. Staples says, he likes to sell them at about four months' old, for if the market is at all good they pay best at that age. Keeping chickens till they are 5 or 6 months of age is a risky business, they may get disease in the meantime; it takes a lot to feed them, and often they fetch no more at 6 months of age than they would have done at 2 months younger.

Indian Runner ducks.

The best price received the past year for cockerels was 8s. 3d. per pair; the highest price received for hens was 6s. 6d per pair. The highest price ever received for eggs was in the drought or dear year of 1901, when he got 2s. 9d. per dozen for hen eggs; the lowest price received was 6d. per dozen on 2nd September, 1903. The lowest price received during the present year was 10½d. per dozen; the highest, 2s. 5¾d., in May last.

Mr. Staples says that although prices for fowls and eggs are now very high, at the same time he made more money when the price was 50 or 60 per cent. less, from the simple fact that feed was then about half the price it is now.

Apart from the above prices, which certainly are good, the laying of the fowls at his farm has become well known, and there is a good sale for stock birds and settings of eggs at considerably more than the market rates, and this without any advertising.

General.

Mr. Staples says: "My experience with fowls began when I was a boy, and I have kept them ever since. I have made a living from them for myself and family for many years, but not without hard work. To be successful in poultry-keeping one must have experience, plenty of energy, and no fear of work. A man that has experience and is not afraid of long hours, seven days in the week, can always make a living from fowls. I would not advise anyone to start poultry-farming who knows nothing about it, for if they have any cash they will soon lose it."

In the February, 1908, *Gazette*, a large poultry farm at Manly was described, and the methods which made it a profitable establishment. This one at Belmore is of considerably less dimensions, and the methods different, yet the owner has reared a large family on it, all showing that there is no hard-and-fast rule in managing fowls.

Hatching, rearing, feeding, and marketing may be all different and successful withal.

The Use of Nitrate of Potash as Manure.

Orchardists who have been using nitrate of potash with sulphate of ammonia and superphosphates as manures in their orchards are somewhat concerned at the higher prices which are now being asked for the nitrate of potash, and inquiries have been made of the Department of Agriculture, as to whether an equivalent can be used in the form of sulphate of potash with nitrate of soda or sulphate of ammonia.

For their information the Department has had prepared by the Chemist a report showing the relative value per unit of nitrogen, and per unit of potash with these manures at present value, and nitrate of potash at £30 per ton.

Mr. Guthrie states that 1 cwt. of pure nitrate of potash contains 52 lb. of potash, and 15½ lb. of nitrogen. A mixture of 1 cwt. of sulphate of potash and 95 lb. (or practically 1 cwt.) of nitrate of soda, will provide these quantities. The cost of a mixture of 1 cwt. of sulphate of potash and 1 cwt. of nitrate of soda will be £1 5s. 9d., as against £1 10s., the cost of 1 cwt. of nitrate of potash.

The unit values are as follow:—

Nitrogen—in nitrate of soda, at £12 5s. per ton ...	15/-
Potash—in sulphate of potash, at £13 10s. per ton ...	5/2

If we estimate the nitrogen and potash in nitrate of potash on the same basis, its manurial value would be only £22 per ton, as against £30 the price usually charged. In spite of this, it is preferred by some fruit-growers even at the higher rate, and there is little doubt that it acts more promptly, and perhaps more effectively, than the similar ingredients mixed in a different form.

The Department is now making inquiries to ascertain whether a supply of nitrate of potash can be obtained in large quantities for the use of Fruit-growers' Unions and others wishing to import large quantities direct, *at a cheaper rate* than the one now quoted.

Hawkesbury Agricultural College and Experiment Farm.

Experiments with Swede Turnips.

A. H. E. McDONALD, Experimentalist.

I.—Trials with Fertilisers.

The object of these trials was to determine the effects of different manures alone, and in combination with each other, upon the yield of turnips. The soil was a fairly open pipeclay loam, overlying a slightly stiff subsoil. It had been cropped previously with wheat for grain.

Superphosphate gives the turnips an early vigorous start. Photo. taken one month after sowing.

The preparation was similar to that adopted in field practice. The land was broken up in December, worked down into a fairly fine condition, and an occasional harrowing given to maintain a fine loose surface, to minimise the loss of moisture by evaporation. At the end of February the land was lightly reploughed, and reduced to a fine condition for sowing by harrowing and rolling. The effect of this preparation was to leave the soil in a condition suitable both for the crop and for good action of the fertilisers. The previous cropping had equalised the soil, and the thorough culture left it in such a state that the crop was able to utilise, to the greatest advantage, its inherent fertility. The pulverisation and deep working encouraged rapid diffusion of the fertilisers to every part of the soil, thus bringing them into close contact with the roots of the plants.

The seed was sown in drills 2 feet 7 inches apart. Previous to sowing the plots to receive fertilisers were shallowly drilled, the fertilisers spread evenly by hand, and well mixed with the soil. The drills were then filled in, and the seed sown 2 inches deep. The variety of swede turnip sown was Skirving's Purple Top, seed sown at the rate of 2 lb. per acre on 11th March. The soil was moist and in splendid condition. An even germination was obtained, and when the plants reached the height of 4 inches, they were thinned out to 8 inches apart. The cultivator was run through the rows about once a month, whilst the crop was growing, to prevent the growth of weeds and to check evaporation of soil moisture.

The experiment contained eighteen plots, eleven of which received applications of fertilisers of different forms, whilst seven consisted of unmanured plots arranged in such a way that each manured plot was adjacent to one

View showing the effects of superphosphate; two months after sowing.

receiving no manure. By adopting this system each manured plot could be compared with the adjoining unmanured one, thus giving a reliable check on the results. The following rainfall was recorded during the time immediately preceding the commencement of the experiment and during its course:—

	Inches		Inches.
February	2·46	June	3·00
March	4·27	July	0·06
April	1·79	August	0·20
May	0·59		
		Total	12·37 inches.

During the early part of the season the rainfall was good, and its regular distribution enabled the crop to make a vigorous start. During May, July, and August the falls were extremely small, and this, combined with the drying windy weather which occurred during the last two months, undoubtedly

affec'ed the yield to some extent. This was particularly the case with the unmanured plots, which were rather backward in their early growth, and were, consequently, not so well developed when the dry weather set in.

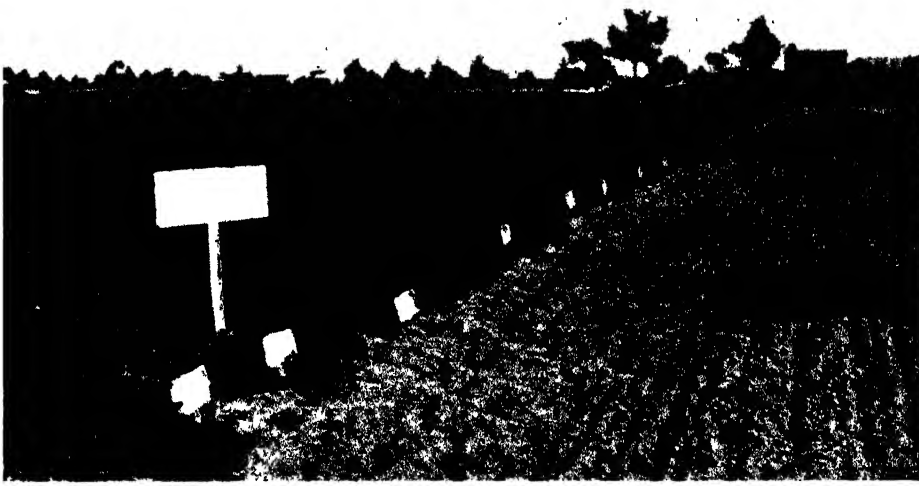
The turnips were harvested on August 13. Two drills in each plot 1 chain in length were dug, the turnips weighed, and the yields calculated at per acre. The results are given in the following table.

EXPERIMENTS with Fertilisers for Swede Turnips. Planted on 11th March; harvested 13th August, 1907.

No. of Plot.	Kind of Manuring.	Quantity of Manure per acre.	Yield per Plot.	Yield per Acre.	Increase in yield.	Decrease in yield.
		cwt. lb.	cwt. qr. lb.	ton. cwt. qr.	ton. cwt. qr.	cwt. qr.
1	Unmanured	......	1 0 2	6 10 0	....	......
2	Superphosphate	2 0	2 1 3	14 10 3	8 0 3	.....
3	Sulphate of potash	1 0	2 1 0	14 7 2	0 3 2	... ..
4	Unmanured	.... .	2 0 25	14 4 0	....	......
5	Nitrate of Soda	1 0	2 1 5	14 13 0	0 9 0	... ..
6	Sulphate of ammonia... ..	0 95	1 2 26	11 1 1	2 13 2	... ..
7	Unmanured	......	1 1 7	8 7 3	....	.....
8	Blood	150	1 2 2	9 13 0	1 5 1	......
9	Not included in this experiment.	......	....	....	....	. ..
10	Unmanured	......	1 2 11	10 4 1	....	......
11	Superphosphate	2 0	... .	....	....	.. ..
	Sulphate of potash	1 0	2 1 8	14 16 2	4 12 1	...
12	Superphosphate . ..	2 0	.. ..	... .	....	... .
	Nitrate of soda	1 0	2 0 20	13 18 1	2 13 2	......
13	Unmanured	......	1 3 1	11 4 3	....	......
14	Sulphate of potash	1 0	....	.	....	.. ...
	Nitrate of soda	1 0	1 2 20	10 14 2	....	10 1
15	Superphosphate	2 0	... .	... .	....	..
	Sulphate of potash	1 0	....	....	....	...
	Nitrate of soda	1 0	2 0 16	13 13 3	2 14 3	... ..
16	Unmanured	... ..	1 2 24	10 19 0	....	
17	Superphosphate	2 0	....	....	....	......
	Sulphate of potash	1 0	....	.. ..	....	... .
	Blood	150	2 0 20	13 18 1	2 19 1	... ..
18	Superphosphate	2 0	....	....	.. ..	.. ..
	Sulphate of potash	1 0	....	....	....	. ...
	Sulphate of ammonia	0 95	2 0 8	13 4 2	3 17 2	... ..
19	Unmanured	. ...	1 1 24	9 7 0	....	.... .

The results show clearly the value of manure. If the unmanured plots are considered it will be seen that, with the exception of one, the yields are comparatively low, and that, on the whole, they agree fairly well one with the other. The results from the manured plots are valuable, indicating as they do the influence exerted upon the crop by the different fertilisers. Prominently above others stand the results following the application of superphosphate. The greatest increase in the series was obtained on the plot manured with it alone, and wherever it was used in combination with other manures its influence cannot fail to be traced. The results go to show that a supply of soluble phosphoric acid is very essential to the turnip crop, owing, not so much to the quantity taken from the soil, but to the peculiar inability it appears to have, in comparison with many other

crops, of utilising the supplies naturally existing in the soil. The superphosphate supplied a readily available form of phosphoric acid, and the crop responded to its application with a largely increased yield. It had a marked effect upon the young plants, inducing a vigorous healthy growth from the very start. Those plots treated with it could easily be detected by their robust appearance immediately they commenced to grow, and they maintained this lead right through. The quick early growth accounts, in part, for the increases in the yields. The early part of the season was moist, while the latter part was abnormally dry and the weather very cold. The plots treated with superphosphate had, however, taken full advantage of the early rains, and the turnips were well developed before the dry weather occurred, whilst those which had not received a dressing were slow in



General view of fertiliser experiment.

growing and did not derive full benefit from the favourable portion of the season. The application of potash and nitrogen seems to have had a beneficial effect upon the crop. This was particularly the case with nitrogen, but before drawing definite conclusions further tests are required.

The results of these experiments are quite in accord with what we should expect in the case of a crop like turnips, which occupies the land for a short period only and is a gross feeder. It requires a considerable quantity of food constituents, and they must be in a form in which they can be used at once by the crop. Crops which occupy the land for long periods, such as wheat, give good yields on comparatively poor soil, largely because of the longer time in which the inert plant food in the soil may become available. This is not the case with turnips, and unless the substances required for its growth are present in a soluble condition in the soil, or are added by

manuring, the yield suffers considerably. Not only must the food constituents be soluble, but they must be in a position where they can be utilised by the crop. It is a shallow rooter, and every effort must be made in the cultivation of the soil and in the application of manures to retain the plant food near the surface, where it can be readily drawn upon by the crop.

Whilst manuring has been shown by these experiments to have such a marked influence upon the yields, it must not be forgotten that it is equally important to bring the soil into a proper physical condition. It should be ploughed deeply some time before sowing and lightly reploughed just previous to planting, as indicated in the beginning of this article. After the crop has commenced to grow, the cultivator should be kept going until the leaves meet across the rows. This maintains a loose surface, which has the effect of lessening evaporation of moisture from the soil, much in the same way as a mulch of straw. Where the soil is allowed to become crusted on the surface, moisture quickly evaporates, but where it is kept loose and fine the moisture rises through the soil as far as the loose broken surface but no farther, and instead of being dissipated into the air is conserved in the soil and utilised by the plant. This intertillage also prevents the growth of weeds, which draw upon fertility and moisture, exhausting profitlessly what should be retained for the use of the crop. In this State the stern fact must be recognised that dry periods will ever recur, and one of the chief objects in all treatment of the soil must be the conservation of moisture in the soil while rain is plentiful, to enable the crop to maintain a healthy growth when the rainfall is scanty.

Trials of Varieties.

This experiment was carried out on a pipeclay loam, similar to that on which the trials with fertilisers were made, which had previously been cropped with wheat. The soil was prepared according to the system outlined in the fertiliser experiment. It was manured with 1 cwt. superphosphate, ½ cwt. sulphate of potash, and ½ cwt. dried blood per acre drilled in with the seed. Sowing was done on 28th February in favourable weather, and a perfect stand obtained. All the varieties were harvested on 25th July. The yields were estimated by harvesting two rows 1 chain in length from each variety, and the results calculated at per acre.

EXPERIMENTS with Swede Turnips; planted 28th February, harvested 25th July, 1907.

Name of Variety.	Yield per plot.			Yield per acre.		
	cwt.	qr.	lb	tons	cwt.	qr.
Skirving's Purple Top ...	2	1	7	14	15	2
Sutton's Champion Purple Top ...	2	1	6	14	14	1
Anderson's Imperial Purple Top...	2	0	23	14	1	3
East Lothian ...	1	2	12	10	5	1
Emperor Green Top ...	1	2	9	10	2	0

Experiments with varieties of Turnips and Swede Turnips in 1908.

The soil and methods of cultivation for this experiment were similar to those of the previous year, with the exception of the manuring. Fifty-six lb. of superphosphate and 28 lb. of sulphate of potash were applied per acre. The calculated yields per acre were obtained by harvesting three rows 2½ chains in length.

The rainfall recorded during the experiment was :—

	Inches.		Inches.
March... ...	1·68	June	0·05
April	1·37	July	1·83
May	0·38	August	4·75
		Total	10·06 inches.

Previous to planting, 9½ inches of rain fell in February.

RESULTS of trials with Swede Turnips, seed obtained in New South Wales. Planted 9th March ; harvested 19th August, 1908.

Name of Variety.	Yield per plot.			Yield per acre.		
	cwt.	qr.	lb.	tons	cwt.	qr.
Skirving's Purple Top	9	1	5	15	16	3
East Lothian	7	3	2	13	4	3
Anderson's Imperial Purple Top .. .	7	2	25	13	3	1
Sutton's Champion Purple Top .	6	1	2	10	13	2
Emperor Green Top	4	1	3	7	8	3

RESULTS of trials with Turnips and Swedes, seed obtained from England. Planted 9th March : harvested 19th August, 1908.

Name of Variety.	Yield per plot.			Yield per acre.		
	cwt	qr.	lb.	tons	cwt.	qr.
Garton's Improved Model Swede...	9	2	17	16	9	0
,, Improved Keepwell	8	3	0	14	18	1
,, Improved Yellow Tankard Turnip	6	0	16	10	9	1
,, Superlative Swede	5	3	16	10	0	3
,, Improved Green Top Scotch Yellow Turnip ...	4	2	13	7	17	1
,, Improved Purple Scotch Yellow Turnip	4	0	24	7	0	2
,, Old Meldrum Green Top Turnip	3	0	14	5	3	1

Hawkesbury Agricultural College.

Score cards are in extensive use at the Hawkesbury Agricultural College, Richmond, in connection with the judging by students of the various farm products and stock. The cards as used for judging lucerne chaff and oaten and wheaten hay are of stout card, 8½ inches by 6½ inches, and have the following printed on one side:—

HAWKESBURY AGRICULTURAL COLLEGE,
Richmond, N.S.W.

STUDENT'S SCORE CARD.

Lucerne Chaff.

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
1. Colour—Bright green preferred; brown in sweated sample not objected to	14	....	....
2. Smell—Fresh, sweet, appetising; free from mustiness	18	....	....
3. Length and cleanness of cut (½ in. to ¾ in. preferred)	12	....	....
4. Fineness and softness of stem	10	....	....
5. Percentage and condition of leaf	14	....	....
6. Purity—Proportion of Lucerne as compared with grasses, &c.	8	....	....
7. Cleanness—Freedom from dust, moulds, objectionable weeds, &c.	16	....	....
8. Weight and general make up for market	8	....	....
Total	100	....	....

No. of Sample .
Name of Student .
Date .

HAWKESBURY AGRICULTURAL COLLEGE,
Richmond, N.S.W.

STUDENT'S SCORE CARD.

Oaten and Wheaten Hay.

Scale of Points.	Maximum Points.	Student's Estimate.	Instructor's Estimate.
1. Colour—Bright green preferred (according to market requirements)	16	....	....
2. Smell—Fresh, sweet, appetising; free from mustiness	20	....	....
3. Fineness of stem (for variety submitted)	8	....	....
4. Softness of stem, not harsh or brittle	12	....	....
5. Amount and quality of leaf	8	....	....
6. Amount and condition of grain (ripeness according to market requirements)	10	....	....
7. Cleanness—Freedom from dust, moulds, and impurities	18	....	....
8. Weight and general make up for market	8	....	....
Total	100	....	....

No. of Sample . Variety .
Name of Student .
Date .

Co-operative Farm Machinery.

P. QUIRK,
Berry Stud Farm.

At the Berry Stud Farm there exists in a small way all the necessary machinery for silage-making, the cost of which, at a low estimate, may be put down at £200, exclusive of the tub-silo. Now, while it is absolutely necessary that each farmer should possess his own silo or silos, the same necessity does not exist for each farmer laying out from £200 to £250 in special plant for cutting and elevating the fodder. When a farmer has a steam-engine or an oil-engine of 6, 8, or 10 b.h.-p., the other expenses for a cutter and elevator or blower are not so serious. Many farmers can afford, or feel justified in erecting a silo; but it is the cost of the necessary machinery that is keeping back silage-making on the coast. The arable land is there; it requires only that means be devised to work this to the best advantage. I have talked and advocated a depôt of co-operative machinery for years: my aim being to suggest a means of placing in the farmers' hands, at a minimum of cost, the same appliances as we have to carry out the work at the Government farm. The want of agricultural machinery is the great drawback to the farmers of the coast. It would cost from £250 to £300 to equip a farm with modern appliances. This first outlay is beyond the means of the average farmer, and what I most strongly recommend is a system of co-operation, and institution of a depôt of agricultural machinery. A society of farmers to be formed, with necessary capital to purchase machinery and let out to the members of the co-operative society only at nominal rates. This system might be carried out by agricultural societies for the benefit of its members, and I feel sure the townsmen would support the expenditure in the interests of the farmers. The system suggested for hiring these machines is that the farmer should receive them in thorough working order and return same to the depôt in the same condition, less reasonable wear and tear. It is not necessary to have in the depôt plant that is in every-day use on a farm, but those special machines only that are required for a few days in the year. Say £350 worth of special machinery is placed in the depôt; this would be about the sum a large farmer would spend to equip his farm, whereas, if worked from the depôt, the £350 would serve twenty or thirty farmers. No doubt this would be an innovation here, but is successfully employed in Ireland; and there is no district better adapted for local trial than the South Coast, as the farms are in close proximity to each other. The question arises: Which is the proper body to take up the scheme? As the agricultural societies on the South Coast are supported principally by farmers, should it not be their one great aim to take the initiative, and form a co-operative depôt?

It has been said several farmers might require a machine at the same time. Would that not be a strong incentive to purchase other machines of the same class to meet the demand? Again, it has been asked where is the capital to come from? In answer I say, we found the capital to build co-operative butter and bacon factories, and we found the money to purchase fodder to keep our cattle alive during the recent drought Supposing there were thirty silos in the district, each 100 tons capacity, that would mean 3,000 tons of silage conserved. This should show the valuable asset such a plant would be to the district. During the late drought, chaff was selling from £6 to £8 per ton, and the price of bran was also high. Now, if chaff is worth £6 per ton, the lowest value that could possibly be placed on silage would be £2 per ton; then 3,000 tons of silage would be worth £6,000 to the district. If such a result could be brought about by the establishment of a co-operative silage outfit, it is a very strong argument in favour of establishing, not one but many in different localities. It has also been said if this scheme is a good one why is it not taken up by private enterprise? The shrewd business man is not going to expend £350 in machinery, and wait for silos to be built. Private contractors will probably come into the field when there are a number of silos, as travelling chaff-cutting plants and threshers do in the wheat-growing districts. It is in the initial stages where co-operation is required.

Editor's Note.

While noting that there are 500,000 silos in America, Mr. Quirk asserted that there is only one in the Illawarra. If this be correct, it is either a serious reflection on the forethought of the dairy farmers of that district, or a high testimony to the favourable and stable conditions of climate which make dairy farming possible over a series of years without any provision for a time of scarcity. As it was mentioned that during the late dry spell, chaff was selling at £6 to £8 per ton, lucerne hay the latter price, and bran at 1s. 8d. per bushel, it would seem as if some of the dairy farmers on the South Coast must have had good reason to inquire into the value of silage and the methods of conserving it in times of plenty.

Mr. Quirk estimated that at these prices silage would be worth £2 per ton, but whether its milk-producing value would be as high as that, is a question which has not yet been settled by a series of satisfactory experiments; but it is a well established fact that good silage can be made at a price ranging from 4s. 6d. to 12s. 6d. per ton according to circumstances, and that the same fodder, if kept for a time of emergency, may have a value very much exceeding its cost, and greater, under certain conditions, than even its milk-producing value, reckoned either by its chemical composition or its results with the bucket.

The Junee P.A.I. Association have invited the co-operation of similar Associations throughout the State in bringing before the Department of Agriculture the necessity of appointing one or more capable men to investigate economical methods of conserving silage, and recommend that such officer

be at once appointed and sent to inspect places where silage has been conserved on a large scale; also to inquire into the Victorian method of Government time payment silos, and their success or otherwise. This laudable action on the part of the Junee Association has met with the hearty sympathy of a number of other Societies who are equally anxious to be advised as to the most economical silage crops for the drier districts, and to get the services of some man capable of supervising the building of silos, the making of silage, and of advising as to the relative merits of pit, stack, tub-silo, ferro-concrete, timber, and other methods and materials. The Junee Association has evidently recognised the fact that, with all the experience gained during the last twenty years, the question of making and conserving silage is still, more or less, in the experimental stage, and deserves much further investigation. It is well known that the system pursued at Jemalong would not succeed in a district with soil of different character and with a heavier rainfall. The man who might succeed in making pit silage on the Western Slopes in a stiff clay loam, and with a rainfall less than 20 inches, might succeed in making nothing more than manure if he pursued the same plan on the Coast district, with a more porous soil, three times the rainfall, and consequent heavy soakage from the soil.

As this State has done much pioneering work in many directions, and has had to pay the cost of failures, as is the fate of all pioneers, whereby other States have benefited by our experience, it will not be amiss if we, in certain cases, hasten slowly, in order to get the benefit of experience gained by other people's mistakes and experimental work. Victoria has led the way in providing silos on a number of farms in certain districts, on conditions as to payment which are generous to the men on the soil. Whether they will turn out to be as fair to the general taxpayer is only one of the many problems to be solved.

In the short time during which the experiment has lasted, enough has been learned to show the value of certain materials for making silos, compared with others; but a good deal more is yet to be learned as to the most effective way of building a cheap silo which will last long enough to warrant the initial capital expenditure. We have seen some silos built of galvanised iron, protected on the inside by paint and other dressings; but it is clearly evident already, that the acids generated in the fermenting silage will find a way of quickly eating through the zinc and iron of which these were built. Some have been built in this State of concrete, reinforced with steel netting, which seem to promise exceedingly well, although apparently very slight in structure, being not more than 4 inches thick. This class of silo needs skilful workmen and exact moulds, and precise proportions of materials; and these requirements necessitate the employment of a skilled class of labour not ordinarily available on the farm.

In districts where cement, sand, and broken metal or gravel can be got cheaply, these silos will be a great success.

Meanwhile, the Minister has provided for the employment of two experts to give practical instruction in the building of silos and the making of silage,

and as soon as Parliament has passed the necessary appropriation, steps will be taken to get the best men procurable in the whole of Australasia, in order to provide for the two distinct classes of settlers who are now concerned with this great problem of the conservation of fodder. One of these will confine his attention to the Coast district, where the dairy farmers have to be served, and the other will work on the Tablelands and Western Slopes where assistance is demanded by pastoralists and farmers who wish to conserve natural grasses, and other fodders grown in those drier climates, for the use of their sheep and other stock in times of scarcity.

The models of different silos which have been made at the Hawkesbury Agricultural College for the instruction of the students, will be duplicated and sent round to different Shows in charge of men competent to explain them; but it is not expected that these will have anything like the educational effect of a few practical demonstrations in the building of silos suitable to the different climatic conditions of the State. Probably the experience gained by the Victorian Department of Agriculture with regard to terms on which these are built for farmers will be of assistance to us in helping the Minister to decide how far he can go in the direction of State aid to those who cannot provide the money for the initial expense. Meanwhile, the question of financial assistance for small holders will not be lost sight of, and the experience of France, Germany, Italy, and Austria with People's Banks, Agricultural Banks, Village Banks, Crédit Foncier, and other forms of co-operative effort subsidised by the State, is being collected and will be published for general information.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE.

Summary for September, 1908.

Air Pressure (Barometer.)			Shade Temperature.				Air Moisture Saturation=100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	Per cent. of year's Evaporation.
29·61	30·29	30·03	33·2	84·8	56·6	57·4	39	94	63	·302	3·835	3·4	7
20	17		16	25			21	5		26			

Rainfall...											
Points	2½	3	25	1	1½	1½	2	1	2	18½	= 58 points.
Dates	2	5	6	7	12	13	17	20	22	30	

Mean for 16 years = 171 points.

Wind ...	N	NE	E	SE	S	SW	W	NW
	2	10	2	2	3	8	1	10

Frosts 1st, 17th, 22nd, 23rd, 24th.

Greatest daily range of temperature, 49·2° on 27th.

W. MERVYN CARNE,
Observer.

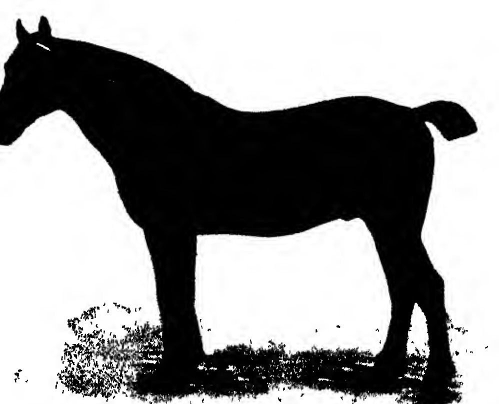
The Almac Cob Stud

The Almac Cob Stud was founded in 1899 by Frank D. Brown, at Kiandra, in the southern part of the State of New South Wales. It is a very mountainous country, and the elevations range from 1,600 feet to 5,000 feet above sea level. At the lower and intermediate levels the valleys fall into the Tumut River, and this part gives very good feed for winter grazing. The higher altitude, which is 8 miles to the westward of Kiandra, is a mixture of undulating plain country, and produces the best of natural grasses for summer feed. The Norfolk cob and the Welsh pony are the breeds of horses of which the Almac Cob Stud is composed. For foundation mares to start the stud, Mr. Brown purchased all those of thoroughbred and pure trotting bred and Welsh pony blood, with conformation, that met his approval, and the result is to-day a very fine group of youngsters, from foals 6 months old to mares 7 years old, that are doing exceedingly well, and the Sydney and Melbourne show rings have seen the geldings brought from the Stud which have won prizes at both Shows and have been sold at a good remuneration to recompense the breeder.

During the last two years Mr. Brown has been able to purchase about fifteen pure-bred cob mares from the States of Victoria and South Australia, where they were bred by Mr. R. G. Wilson, who has imported sires and dams, and Mr. C. H. Angus, who also has imported sires and dams; and from these mares Mr. Brown feels satisfied he will be able to show stallions bred in the State of New South Wales that will prove of good benefit in assisting others to advance in the breeding of true cobs. The pony mares were purchased from different States throughout Australia, and four very fine pony stallions have already been sold in different parts of Australia, and the result of the use of them is proving beneficial to pony breeders.

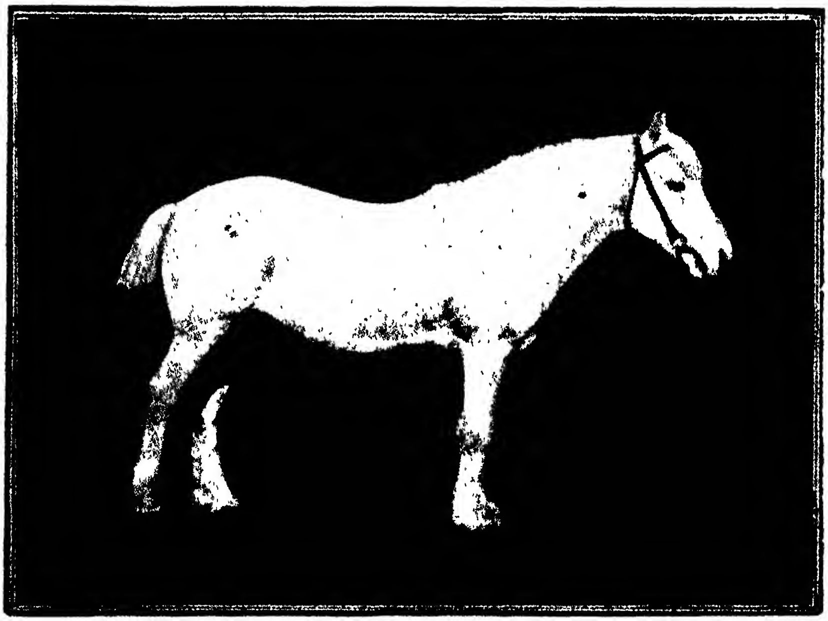
We show the photographs of two of Mr. Brown's cob stallions and one of his pony stallion; also one of a pure-bred cob mare, a half-bred cob gelding, and a half-bred cob gelding shown in saddle with the owner of the Almac Cob Stud.

Almac.—The first cob stallion Mr. Brown interested himself in, was bred in New South Wales by Mr. Thomas Cook, of Turonville, Scone. His sire, Flying Shales (imp.), was a very superior horse and a most prepotent sire, and



Almac, Champion Cob Stallion.

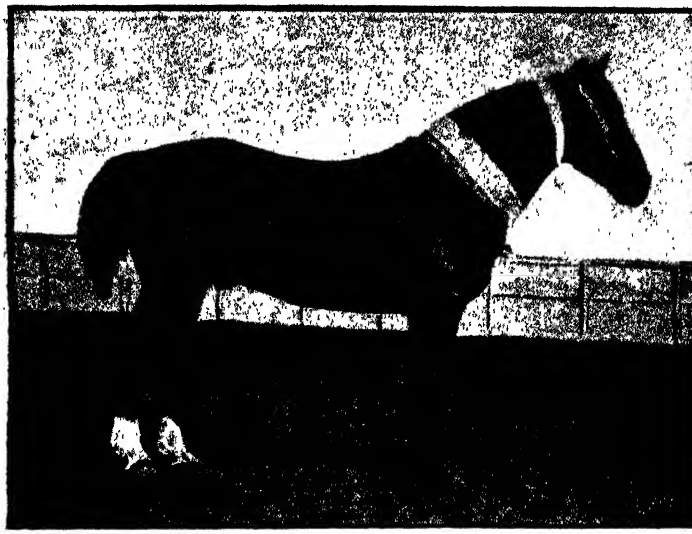
a very fast trotter, as in his day he has trotted 17½ miles within the hour. He was a horse of wonderful vitality, and proved himself a good sire at 28 years of age. All his stock have the best of dispositions, and Almac is indeed a very fine docile stallion, now rising 16 years old. The dam of Almac, Gipsy, was also bred by Mr. Cook, and her sire was Flying Shales, so you will note the result of inbreeding with a sire to his daughter. Almac is a beautiful rich dark bay with black points, and stands only 14½ hands high, and when in condition he has turned the scale at nearly 1,200 lb. His bone is over 8 inches below the knee, and to-day, as a 16-year-old, he is as sound as a bell. Almac won first prize for two years at Sydney Royal Agricultural Society's Show.



Snowball. Sire, Bismark; dam, Tam-o'-Shanter.

Snowball.—A Welsh pony, bred in South Australia, and purchased from there by Mr. Brown. His sire was Bismark, and his dam by the celebrated Tam O'Shanter, the great progenitor of ponies in the State of Victoria. Although Snowball is only 12½ hands high, he is strong, and well able to carry 18 or 20 stone. He is now also 16 years of age and has proved himself a very valuable sire, and the constitution he has will probably see him live to an old age, as he runs with his mares summer and winter in the hills, and the country is as much like the mountain ranges in Wales as can be compared. Snowball won first prize at Sydney Royal Agricultural Society's Show.

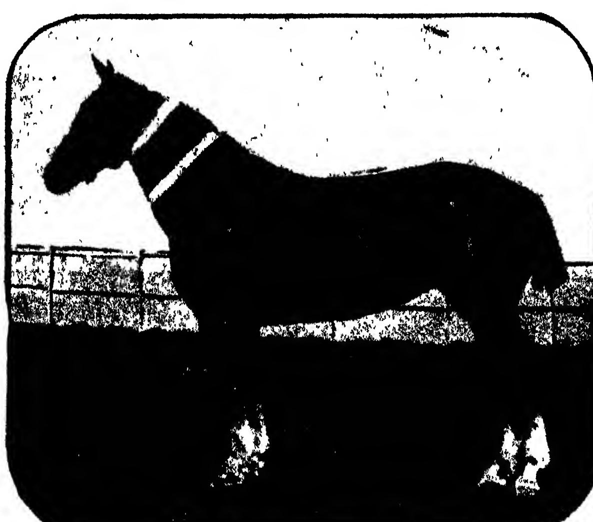
Vim.—A pure-bred Norfolk cob, bred in Victoria by the late Hon. W. I. Winter Irving, M.L.C., who imported Vim's sire, Detective, and his dam, Darwinia, from England. Vim is a chestnut horse, 14.3 hands high, and



Vim. Sire, Detective (imp.); dam, Darwinia (imp.).

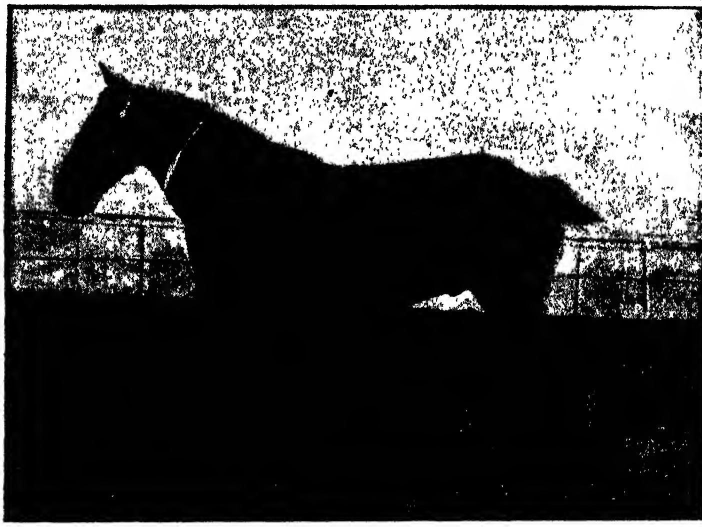
shows great dash with beautiful action, and a very fast trotter. He won first and champion prize at Sydney Royal Agricultural Society's Show.

Vis.—A chestnut mare and a full sister to Vim, and she was bred in Victoria by the late Hon. W. I. Winter Irving, M.L.C.. Vis stands 14.3 hands high, is strong enough to pull a spring cart or hansom cab, and is a



Vis, pure-bred cob mare. Sire, Detective (imp.); dam, Darwinia (imp.).

very fast mare in harness, with beautiful action and a fine disposition. She won the double at Sydney Royal Agricultural Society's Show by annexing the dogcart class and the special for best cob in two-wheel vehicle.



Barnum, bay cob. Sire, Almack; dam, half-bred mare.

Barnum.—Bay gelding, 14.3 hands high, bred at the Almac Cob Stud. His sire is Almac, and his dam a thick-set mare, whose sire was a trotting horse and her dam a half-bred mare. This shows the class of horse produced by the first cross with the Norfolk cob Almac to a half-bred mare. Barnum has won two first prizes at Sydney Royal Agricultural Society's Shows, one in saddle and the other in harness as a gentleman's cob. He is a very rich dark bay, like his sire, and coming from a mare a little heavier than his sire he shows a bit more substance, but with it he has good pace and a kind disposition.

George.—A dark bay horse, bred by the Almac Cob Stud, 14.3 hands high. The photograph showing him shows Mr. Brown, the breeder, in the saddle, and George is carrying 20 stone, and with it has won prizes at Sydney and Melbourne Royal Agricultural Society's Shows. George is also a son of Almac, out of a very well-bred, sturdy mare, bred on the Monaro country, a mare that one could ride or drive, as she was very hardy; and George has also proved himself a very hardy useful animal in saddle or harness.

George and owner. Sire Almac; dam, Monaro mare.

Mr. Brown also has an imported cob stallion called Reality, an imported Welsh pony stallion named Vero, and a Victorian-bred Welsh pony stallion named Young Wonder, whose photographs we shall show in another article at a later date.

The result of crossing the mares bred at the Almac Cob Stud by Almac with Vim has proved successful, and the same may be said of the cross of the ponies bred by Snowball to the other pony stallions. It is hoped that in a few years' time the horses coming from the Almac Stud will be an object lesson to show what can be done by breeding from pure-bred sires to good conformation mares with some breeding, and retaining the fillies from each cross to stint back to other pure-bred sires of the same class, and after two crosses out, to return the third cross to the original sire, to still retain the conformation and keep the blood pure so long as a sire will prove himself prepotent.

SULTANAS ON PHYLLOXERA-RESISTANT STOCKS.

M. BLUNNO.

THOMPSON'S Seedless, a grape grown for drying purposes, very similar to the Sultana, has been grafted on phylloxera-resistant stocks at Howlong Viticultural Station with some success. In the year 1904 a crop yielding at the rate of 9,046 lb. per acre was obtained. This was no doubt an abnormal one, and has not been reached in any year since on any variety of stock. The stock which gave this yield was the hybrid Riparia x Rupestris No. $101\frac{14}{}$. As these abnormal crops may occur, they must be carefully excised from any data used for calculation, as it would undoubtedly mislead one into expecting such yields.

The experience with seedless grape-vines grafted on resistant stocks is at present limited. There is no previous European experience to go on, as the Levant, the home of the seedless raisin industry, is one of the few vine-growing districts as yet free from the pest. At the Howlong Viticultural Station the results of experiments have been various, but so far no definite information is available. The experience of one grower near Junee is that the Sultana bears as well when grafted on Rupestris Metallica as on its own roots. It may with almost perfect safety be said that Thompson's Seedless would behave in a similar manner.

The experience at Howlong, and also in Victoria, indicates that the crops are rather erratic, and until more is known of their behaviour on phylloxera-resistant stocks it behoves intending planters to proceed slowly with putting out seedless grapes not on their own roots. It is very desirable that a more complete knowledge of their behaviour should be obtained, and in this connection vine-growers, in those districts suited to the Sultana, can assist the industry by conducting trials on a small scale and keeping a record of the results, and communicating the same to the Department.

Stack Silage.

G. M. McKEOWN,
Wagga Experiment Farm.

THE advantages of conserving green fodder in stacks consists in the economy of the process, the cost being nominal only. A further advantage is that where the crop is good or the growth of natural herbage is luxuriant, stacks may be constructed in localities so situated as to require cartage for short distances only. Such sites should, as far as possible, be chosen with a view to economical stacking or pitting and distribution of the silage when being fed out, therefore this advantage will be gained by building where paddocks converge. A well drained site should be selected, and, if necessary, it should be levelled to ensure a secure base. The ground should be covered with timber evenly laid on the surface, or with a good bed of straw, to prevent moisture rising from the soil into the fodder. All surface water should be cut off. If logs are used as a bed, all space should be well filled with earth to prevent access of air into the bottom of the stack.

So long as the weather is fit for cutting by mowing machine or reaper and binder, it will not matter if the material is wet at the time of stacking, as it will not suffer damage.

In this point silage-making possesses a great advantage over hay-making, as in the latter case dry warm weather is essential to success.

It is of the greatest importance that the base of the stack should be of right dimensions, so as to ensure the least possible amount of surface exposure and the exercise of the greatest possible pressure on the lower part of the stack by the upper portion of the material, therefore a careful estimate of the amount of available fodder should be made before commencing to build. It is inadvisable to build small stacks, owing to the greater waste consequent on the larger surface exposure in proportion to the quantity of material. A stack to contain 25 tons should be the least size that should be attempted, and where only this quantity of fodder is available, it will be found preferable to use a pit or a disused room or building if such is available, as in the latter case even a much less quantity may be conserved. The base of a 25-ton stack should be about 10 by 10 feet. About 45 cubic feet of good silage will make a ton. Stacks to contain from 50 tons upwards will be found preferable owing to lower proportionate waste, and the larger they can conveniently be built the better. A base of 14 feet square will carry 50 to 60 tons, and 18 feet square will carry 120 tons, and so on in proportion if not built too rapidly. It is preferable to allow intervals for settlement, as by thus allowing time the stack may be more compactly built and the lift may be considerably reduced. Where a large quantity of material is available, the erection of two or more stacks may be proceeded with alternately, and thus no time need be lost.

The best time to cut grass and other natural herbage is when it is in flower, and cutting may be continued as long as the crop is in succulent condition. It should be carted and stacked as promptly as possible so as to prevent loss of moisture.

Wheat, barley, vetches, and peas should be in a similar stage of growth in the drier districts, while in coastal and other moist localities they may safely be cut in a more advanced condition, as in the latter case the fodder is likely to contain more moisture than is usual under the former conditions, and they do not dry off so rapidly after cutting.

Wheat alone is of rather too dry a nature for successful conservation in stacks, therefore it will be found safer to conserve it in pits from which air may be excluded more effectively than is possible where stacking is adopted.

Where natural grasses are to be conserved, pits will be more effectual than stacks, as, owing to the number of varieties of which most pastures consist, the periods of ripening vary so much that the earlier kinds lose much of their succulence, while others remain in a backward condition. In cases where trefoil or variegated thistles predominate, the stack system may safely be adopted, as both contain a much larger proportion of moisture than is to be found in the grasses, even where the latter are in their best stage of growth.

In dry districts it will be found advisable also to cut sorghum and maize at an earlier stage of growth than is usual in the moister conditions prevailing on the coast, and to use pits or buildings in preference to stacks, as the comparative dryness of the fodder causes greater loss in stacks than that which occurs in the case of fodder plants of finer texture, which admit of more compact stacking than is possible with those of coarser growth.

The chaffing of maize or sorghum is recommended, and therefore their conservation in a walled receptacle is necessary to secure the best results in quality and quantity of silage. The material if stacked whole, should be spread evenly, and if cut with a reaper and binder the bands should be cut and drawn so as to admit of more compact building and the more effectual exclusion of air. If the bands are left intact, there are liable to be considerable spaces between the sheaves if they are of full size. The butts of the sheaves should be placed outwards, each row binding the next, and the material should be well trodden from the start. Under no circumstances should material be placed transversely in layers, as by this means a large quantity of air will be admitted into the stack and loss of fodder will naturally follow. Special attention should be paid to the sides and corners, so that they may be as compact as possible. The sides should be kept plumb, and the corners well rounded off. The surface of the stack should be kept quite level while in the course of erection, as, if the middle be raised, the material when saturated with moisture has a tendency to slip outwards; and an outward slip is much worse than an inward one, as it is difficult to remedy. Should an outward slip occur, it should at once be remedied by strong supports being placed on that side of the stack. Greater safety in building may be secured by the erection of a few posts with occasional pieces of timber secured to them horizontally on each side of the stack.

At the close of each day's work it is advisable to apply some pressure to assist in consolidating the material, and some heavy timbers of good length will be found very useful for the purpose. The weights should be removed on resuming work, but on the completion of the stack they should be allowed to remain on top. The material should be thoroughly compressed by treading during the erection of the stack, and this operation will be greatly assisted where some support to the sides such as described is afforded. Pressure may be applied by mechanical appliances, or by placing heavy timbers, stones, bags of earth, &c., on the surface of the stack. Sufficient pressure should be used to ensure the thorough compression of the material in the upper portion of the stack, which, in its turn, provides pressure for the lower portions. Failure to exclude air by insufficient treading of the material, or by insufficient application of pressure to the upper portion of the stack, may cause spontaneous combustion, or, at any rate, considerable actual loss of material by overheating. Similar results may arise from the use of material which has passed the requisite stage of succulence. Should it be desired to take the temperature, a piece of metal pipe should be built into the stack, so as to admit of a thermometer being suspended, by means of a flexible wire, fairly in the middle of the stack. The thermometer can then be withdrawn when it is desired to ascertain the temperature. Fermentation commences at 90 degrees Fahr.; and, as it is undesirable that the temperature should rise above 150 degrees Fahr., more pressure should be applied should it appear likely that the limit will be exceeded.

A stack, when built as high as possible, may be rounded on top and well covered with straw, so placed as to throw the rain off; or it may be covered with galvanized iron or roofing felt. The more permanent roofing is to be preferred in districts liable to heavy rain, and there the use of the latter material will be advantageous for protecting the sides.

A stack may be opened and the fodder used in eight to twelve weeks after completion; but sufficient for the day's consumption only should be removed, as it is liable to deteriorate when exposed to the air. A hay-knife should be used to cut it out.

As little as possible of the opened portion of the stack should be exposed, and loss may be prevented by covering it with a tarpaulin or dry straw.

The feeding value of silage will be greatly improved by a selection of varieties of plants, which, where possible, should be grown together for convenience in harvesting and stacking, and so as to ensure a more regular admixture of fodder plants possessing varied qualities.

Thus, field-peas or vetches should be sown with oats, barley, or wheat intended for silage; and, apart from the added value of the silage, the leguminous plants will prove of value in fertilising the soil. The growth of crops for silage will prove of great value in combating the black oats pest, as, owing to the necessity for cutting such crops before maturity, weeds may be removed before the seeds can ripen.

Where conditions are favourable for the growth of cowpeas, they may be sown with maize or sorghum, or in separate areas, and the respective crops mixed when stacking or pitting.

Lucerne, also, may be profitably harvested from the area devoted to its separate culture, and mixed with any crop with which the growing period corresponds.

For feeding cattle the quantity of silage to be used will vary with the age and size of the animals, and the quantity of natural pasture which is available.

The nutrient value of the fodder will naturally vary with the crops composing the silage, but in most cases it will be found desirable to add to the ration some grain, oilcake, or bran. The silage ration will range from 15 to 45 lb. per day, according to the conditions described and the purpose for which the stock are fed. For sheep, the allowance should be 3 or 4 lb. per head, with about 4 oz. of grain per day where improved condition is sought.

Where it is desired to conserve fodder in pits in the drier districts, it will be found that the cost of excavation is very moderate, amounting to about £5 for a 100-ton pit. Two of the sides should be vertical, and well trimmed, the other two having batters of 1 to 2, or 1 to 3, so as to admit of working the plough and scoop during the excavation of the pit, and for convenience in filling it with fodder after completion.

In filling the pit, the instructions for stacking should be carefully followed, but the compression of the material and the exclusion of air will be found much easier than is the case in stack building.

The work of consolidation will be greatly assisted by the passage over it of the teams conveying the fodder, which should be driven in at one end and out at the other. In large pits a horse and rider will do good work in trampling the fodder after it has been spread.

The material may be extended a fair distance outwards along the deeper parts of the batters, and, if necessary, carried above ground as a stack to such a height as may be convenient. When extended far above the surface, pressure will be necessary to consolidate the upper portion; but if the excavation only be filled, covering with the earth which has been removed from it will exert sufficient pressure, while at the same time it will prevent the access of air.

The durability of silage conserved in dry pits should exceed that of stack silage, as the outsides are not subject to the action of air or rainfall.

On the Wagga Wagga Experiment Farm the cost of silage has ranged from 2s. 9d. per ton for natural herbage to 6s. for cultivated crops.

Botanical Notes.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 98. *Sporobolus actinocladus*, F.v.M.

Botanical Name.—Actinocladus, Greek, *actis*, *actinos*, a ray (of the sun), a spoke of a wheel, &c.; *clados*, a young branch or shoot, the panicle branches being verticillate (rayed).

Aboriginal Names.—"Katura" of the Boulia natives (Queensland); "Coocheramunda" of the Georgina natives, Queensland (Coghlan, quoted by Bailey); "Gnurinurn" of those about Lake Eyre, South Australia (Spencer).

Botanical Description (B.Fl. vii, 623).—

Stems 1 to 2 feet high.

Leaves flat, tapering to fine points, glabrous.

Panicle pyramidal, 3 to 5 inches long, the branches numerous, spreading, the lower ones, or nearly all, verticillate at regular intervals, the upper ones scattered, all capillary and shortly bare at the base, but bearing narrow, dense, spikelike partial panicles of ½ to 1 inch.

Spikelets sessile and crowded (*Nota bene* !), nearly 1 line long.

Outer glume very small, hyaline, almost obtuse; second very acute, keeled, ½ to ⅔ line long.

Flowering glume similar, but longer.

Palea divided into two from the base, even at the time of flowering.

Seed enclosed in a loose pericarp.

Note the verticillate branches of the panicle.

Value as a Fodder.—A useful grass for the dry, hot districts of the State.

Human Food.—Dr. Roth, late Protector of Aborigines, Northern Queensland, points out that this grass is one of those species whose seeds are used as food, and gives the following account of the method of collecting and preparing it:—

> The grass is cut down, tied into small bundles, taken down to the nearest waterhole, and dipped under, just for a minute or two; the bundles are next laid out to dry in the sun for a quarter of an hour or so, but to prevent the desiccation taking place too rapidly, especially on a very hot day, they may be covered over with some other grasses or bushes. When the moisture has been sufficiently removed, each bundle is firmly held by the stalk portion with one hand, while the head portion is gently brushed over and squeezed with the other, the seed so loosened being allowed to fall into the water contained in a wooden bowl beneath. The water is drawn off subsequently by tipping up the vessel, and so letting the fluid escape through the interdigital spaces of the hollowed hand. The seed itself is then dried again before being ground and made up into a "damper."

Habitat and Range.—Found in all the colonies except Western Australia, Tasmania, and Victoria. It occurs in the dry western districts of New South Wales.

The type came from Sturt's Creek, Central Australia, and was collected by Mueller himself.

Bentham also quotes:—

Queensland.—Gracemere (O'Shanesy); Ballandool River (Looker).

Central Australia.—Charlotte Waters (Giles).

SPOROBOLUS ACTINOCLADUS, F.v M.

In the National Herbarium, Sydney, we have it from—

South Australia.—Charlotte Waters (though not Giles); Oakden Hills Station, 100 miles north of Port Augusta (W. Gill); Lake Eyre (W. Baldwin Spencer), "Gnurinurn." "The blacks do not eat seeds." This is, of course, contrary to what obtains in Queensland, according to Roth.

Queensland.—Jericho, 300 miles west of Rockhampton (R. Simmons); Boulia (F. M. Bailey). A very common inland grass (F. M. Bailey).

New South Wales.—Brewarrina (J. L. Boorman); Wonnaminta, Wilcannia (Mrs. Kennedy).

EXPLANATION OF PLATE.

1. Entire plant, half size.
2. Branch of the panicle, greatly enlarged.
3. Ultimate branch of the panicle.
4. Single spikelet, opened out, showing the glumes, the palea divided into two, and the seed enclosed in the loose pericarp.
5. Glumes and seed of the single spikelet.
   - *a.* Outer glume.
   - *b.* Second glume.
   - *c.* Flowering glume.
   - *d.* Palea divided into two from the base.
   - *e.* Pericarp, seed taken out.
   - *f.* Grain, without the pericarp.

A New Suspected Poison Plant.

The following letter has been received:—

"Wingecarribbee, Bowral, 5th September, 1908.

"The Director of Agriculture,

"I have the honor to forward to you, by this post, a sample of a lily or weed growing wild here, which some pigs were seen to be rooting up and eating the roots.

"Several valuable pigs and some suckers that were just beginning to pick about died. One sow got very ill, and, after lingering for a week, recovered. The Inspector of Stock says that it is no disease the pigs had, but that they had apparently been poisoned, and suggests that I forward you a sample of weed. I shall be glad to know if anything of a poisonous nature is in the weed. It has a blue flower.

"H. M. OXLEY."

The root specimens are, in my opinion, *Dianella*, but I cannot determine the species with certainty without flowers or fruits. *Dianella* is an exceedingly common Australian plant belonging to the lily family. It has strap-shaped leaves and blue flowers.

Nothing is known about the properties of the Australian species of *Dianella*, except that some have been occasionally used as fibre-plants. Certainly I have never heard of them as suspected poison plants before.

On inquiry I find that Dragendorff mentions *Dianella nemorosa*, L., and *D. ensifolia*, Ait., as medicinal plants, and says the roots are used in cases of

Dysuria and other complaints. He mentions further that the former plant is used in the Straits Settlements in the preparation of rat-poison, but does not state what part of the plant is used.

There may, therefore, be some foundation in the report that the roots of *Dianella* are poisonous, but we should first ascertain the species.

Dianella roots are long finger-like processes, in masses like a bundle of the old tallow candles strung together. Here is certainly *primâ facie* evidence warranting a careful chemical investigation of the roots of these common Australian plants.

A Valuable Fibre Plant (*Asclepias semilunata*).

In the *Gazette* for July, 1908, p. 585, is a note under the above heading. The plant being unknown in Australia I had, in the meantime, communicated with Kew and Mr. J. Burtt Davy, the Government Botanist of the Transvaal. The replies are now to hand.

Mr. Davy says :—

I do not think any reliance can be placed on the statement that it has stood the winter of Johannesburg. During the last five years my correspondents and I have been energetically collecting Asclepiads, and *A. semilunata* has not turned up in any of our Transvaal collections. I think it is very unlikely that it occurs with us.

With the exception of the alien species *A. fruticosa* and an allied indigenous species *A. rivularis*, it is doubtful whether any of ours are of use as fibre plants. We often receive samples of the silky seed-hairs, from persons who think they may be useful as a substitute for cotton, but as they lack the *twist* and are inferior to cotton, I do not see how they can be of any commercial value.

If we turn to the Kew *Bulletin* we get the following information :—

"Fibre from Uganda (*Asclepias semilunata*), N.E. Br., Asclepiadeæ."

Mr. M. T. Dawe, Director, Scientific and Forestry Department, Uganda, has forwarded for the Musem a sample of fibre prepared from the stems of this plant, which attains a height of 2–5 feet, and is found in Nile Land, Lower Guinea, and South Central Africa. A report on this fibre appeared in the *Bulletin* of the Imperial Institute, Vol. iii, No. 4, 1906, p. 316 (*Kew Bulletin of Misc. Information*, No. 9, 1906, p. 397).

The reference in the "Bulletin of the Imperial Institute" is to an article entitled "The fibre of *Asclepias semilunata* from Uganda."

A chemical examination of the fibre is given and the paper, which cannot usefully be briefly abstracted, should be referred to. The concluding paragraph is as follows :—

The fibre of *Asclepias semilunata* therefore appears worthy of further attention in Uganda, especially if the plant is abundant or can be easily cultivated. In this case efforts should be directed to the production of a uniformly long fibre, as the value of the product in this form will be much greater than if a considerable proportion of short fibres is present. The short fibres would probably only be commercially useful in the event of the technical experiments, to which reference has been made, proving successful.

The evidence so far available points to the fact that this plant belongs to tropical country solely, viz., Uganda, a British Protectorate of Central Africa, north-west of the Victoria Nyanza, and not far from the Equator.

Acclimatisation experiments are proverbially full of surprises, and whether the plant will flourish in any part of New South Wales is a matter for experiment. If it does do so in any locality, then the cost of production of the fibre and the demand of this particular kind will have to be gone into.

Yanco Irrigation Farm.

W. J. ALLEN.

The starting of this, the first irrigation farm, by the Department of Agriculture, under the Great Northern Murrumbidgee Irrigation Scheme, is the beginning of the utilisation of the surplus waters of the State. It is one of the most, if not the most important work which the Government has yet undertaken, as it is hard to estimate the value which will be derived by the people of Australia from the wedding of the water to the land. As years go by and the population increases, the conservation of water and its application to the land must of necessity receive the attention which it deserves.

Irrigation—what does it mean? A method of producing or increasing fertility in soils by an artificial supply of water. Up to the present its value has not been understood by the people of Australia. We have the land, which, with the aid of water, will produce any crops that can be grown in a semi-tropical country. We have the water, flowing on and on to the ocean by the millions of cubic feet annually in years of plenty and in years of drought; yet we have always said "sufficient unto the day is the evil thereof," and so far have been entirely satisfied with ourselves during years when the rainfall has been good, congratulating ourselves with the fact that with a fair rainfall Australia is one of the best countries in the world, where cereals and fruits will grow to perfection, and stock can be seen fat all the year round, excepting—yes, I am sorry to have to use that word—excepting when the rainfall falls below our requirements. In many parts of the State a very little suffices to produce ample feed for stock, and we have soil on which wheat will mature and yield splendid crops on a 10 to 12 inch rainfall. Most of our wheats and fruits, however, are grown where the rainfall averages from 14 to 24 inches.

When droughts occur, which they do with unfailing regularity, they find us quite unprepared to withstand their severity, with the natural result that the loss of stock is enormous during such years. In a large country

Panoramic view of Yanco Irrigation Farm.

like Australia it may be found difficult to make provision which will ensure against losses in isolated places in our interior, but by making the most of our rivers and artesian water supply, not only can we save the most of our stock during dry years, but fruit-growing, dairying, pig and lamb raising may be carried on successfully, placing us in a position to defy the drought, and the result would be that wide tracts of what at present may be classed as almost desert land may be turned into a productive farming country, on which hundreds of thousands of people will yet make their homes, on areas of from 10 to 100 acres of land.

Showing the country before clearing.

The starting of the Great Northern Murrumbidgee Irrigation Scheme is one which, when completed, will provide sufficient water to irrigate large tracts of land lying between Narrandera and Gunbar, and should prove an untold blessing to the whole of this southern country; and the Government, by initiating this irrigation farm at the present time, will be in a position to supply considerable valuable information to intending settlers in the near future, or when the Barren Jack dam and the channels will be so far completed, as to be able to supply water for lands under this scheme.

The place will be an object lesson as to what will grow on this particular soil. A good assortment of grape-vines, fruit and nut trees, have been planted. Hay and fodder crops have been sown, and the Department is desirous of showing what can be grown on this land, which is classed as second quality, there being large tracts of the better soil lower down the canal, but where it would be difficult at present to obtain water.

The present site has the advantage of being easily seen from the train, which in itself is a great advantage, as the public have a good view of the

A large Box tree felled.

20 h.p. Ploughing Engine at work breaking up the soil.

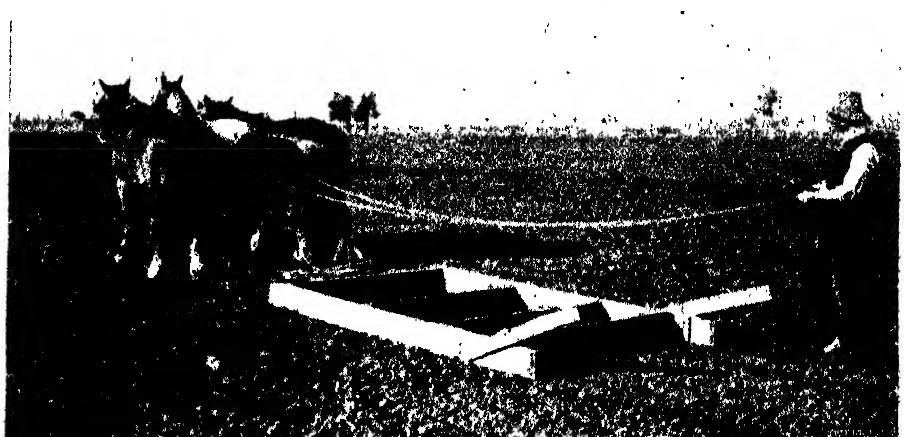
farm while travelling, and it is easy of access for those who wish to visit it, lying as it does within a few hundred yards of the Yanco platform, where all trains stop. There is no accommodation at this place yet, but visitors may leave Narrandera at midday, have an hour and a half on the farm, and, returning, reach Narrandera at 2·30 p.m.

Contractor working buck-scraper.

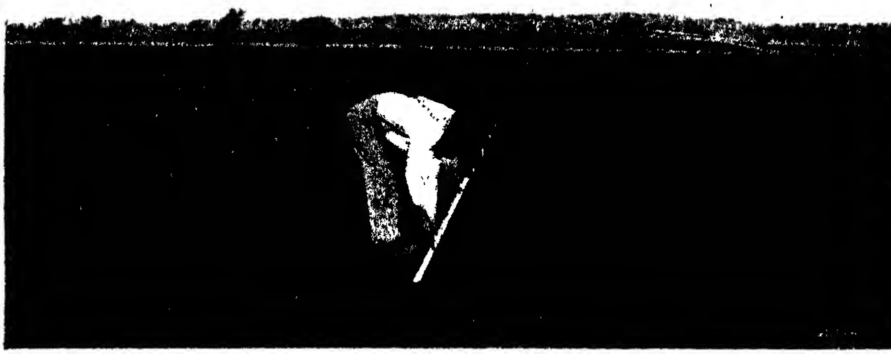
The problem which will be the best industry to follow on this land will depend largely on the person and the soil. It should be an ideal place for the dairyman, as there is no soil which will produce heavier crops of corn, sorghums, &c., than the rich, heavy soils, found in many parts of the area which it is proposed to irrigate, and not unlike part of the present Irrigation Farm. Then there are some of the lighter and mallee lands, on which lucerne will grow to perfection, which will be the home of the sheep and pig enthusiasts.

Almost any of the soil will produce good crops of cereals, vegetables, tobacco, &c. Horse breeding should prove very profitable here, where plenty of green feed can always be relied upon.

If one or two irrigations can be given to wheat land it will make the difference between a good crop of, say, six bags to the acre and no crop, or only two or three bags; in fact, there are great possibilities for those who



Home-made leveller at work; an invaluable implement.



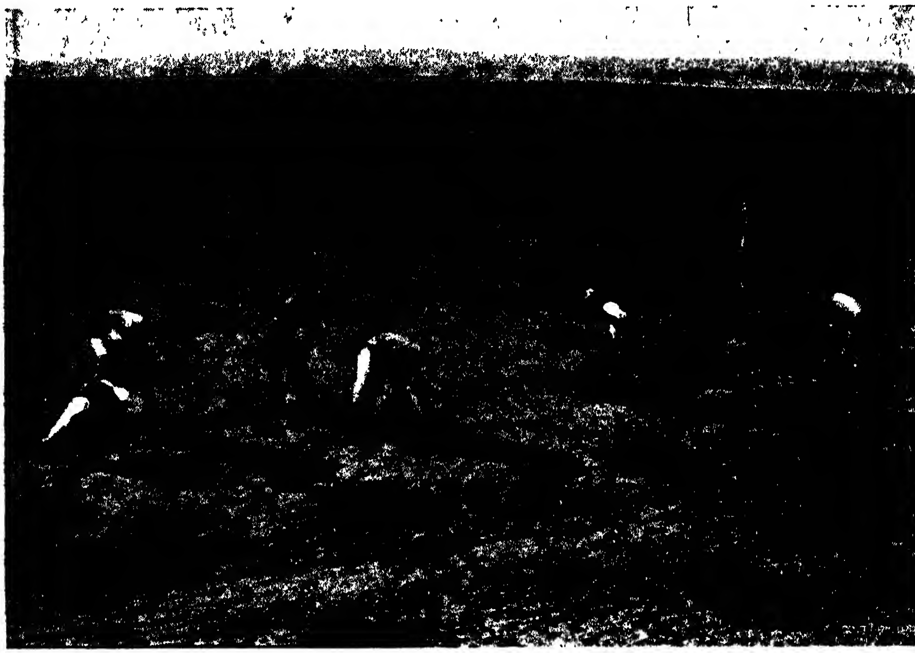
Staking out the orchard and vineyard.

will do the work thoroughly, that is by the combination of a thorough system of cultivation and watering; but it must not be forgotten that too much water supplied by irrigation results just as disastrously as drought.

It is intended to find out how the various crops do on this soil, and it is quite possible that experiments in pig and sheep raising on a limited scale may be made later. For instance, it might be well to know how many sheep could be kept on 20 acres of lucerne, or how many pigs on 10 acres. Also how cows would milk when fed all the year round on lucerne, sorghums and corn, either in the green or dried state, or as silage.

Horses for working the farm are necessary, and therefore a few foals will be raised each year, and everything done that will help to make this farm of the most practical use to the man who is seeking information for the

Holes dug ready to receive fruit-trees.



Planting the vineyard.

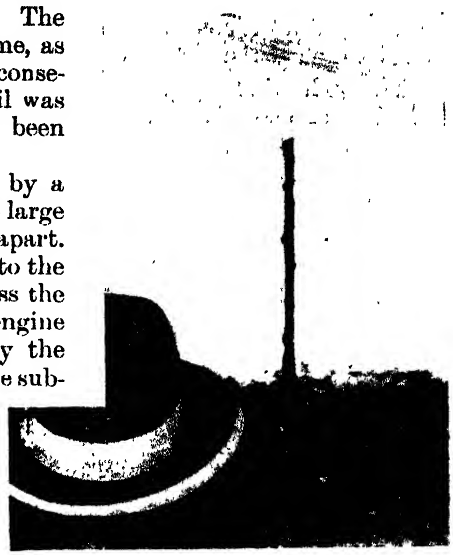
purpose of settling on these lands. It is a question whether any grasses will ever produce the same amount of feed as lucerne, corn and sorghums, but Rhodes and other kinds will be tested.

The work of grubbing and clearing the timber (pine, box, and boree) from the land was started in April, and completed about the 1st of June. The ploughing was started simultaneously with the clearing. This latter

Planting fruit-trees.

(clearing) was done by day labour, and the roots taken out to a depth of 20 inches. The ground was particularly hard at this time, as no rain had fallen for months, and consequently the expense of clearing the soil was considerably more than it would have been had the soil been moist.

The breaking of the soil was done by a large scarifier, which was drawn by two large traction engines, standing about 500 feet apart. A cable from each of these was fastened to the scarifier, and the latter was drawn across the space alternately by the engines, each engine moving up after each round made by the scarifier. This machine did not turn up the subsoil, but broke it up to a depth of from 18 to 20 inches, and would have gone deeper had it not been that the ground was so hard and dry.

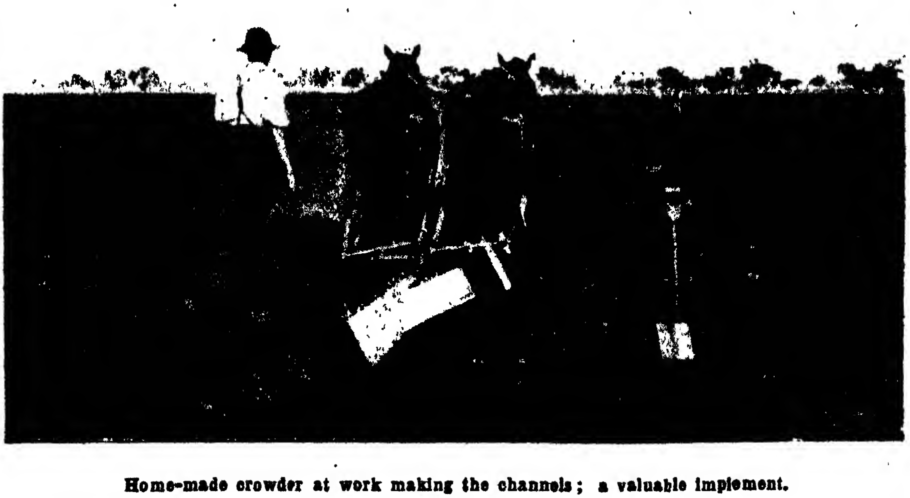


The first tree planted under this great irrigation scheme.

That portion planted to vines and trees was worked both ways with the machine, but the lucerne, wheat, oats and barley ground was only worked once. The traction engines and scarifier were kindly lent to the Department by Sir Samuel McCaughey, and without these we would have had a very difficult task in breaking up the soil in time for planting this season.

After the land was all broken up, the work of breaking the lumps and filling in old channels and preparing the land for the several crops, trees and vines, was no small contract, and it was not until July that we finished sowing the hay crops, which comprise the following :—

4 acres	malting barley	13 acres	John Brown wheat
3 ,,	skinless barley	1 ,,	Plover wheat
7 ,,	Algerian oats	10 ,,	Bobs wheat



Home-made crowder at work making the channels; a valuable implement.

Thirty-three acres have already been sown with lucerne, some of which is up nicely, and all the above crops are making fair headway, notwithstanding the fact that they were sown very late.

The orchard and vineyard are laid out in six different blocks, and 30 acres of vines of different varieties, in which are planted 10 acres of Sultanas, 10 acres of Gordo Blancos, 5 acres of Zante currants, and 5 acres of assorted table-grapes.

Supply channel in the orchard, about 3,000 feet long.

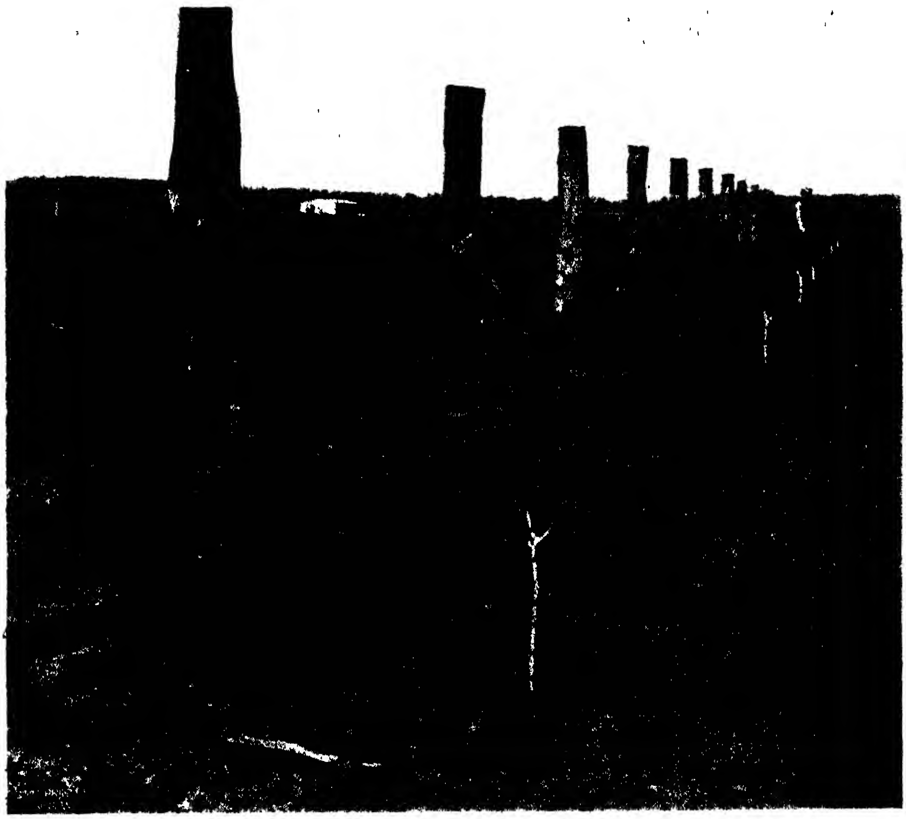
A small block of about 6 acres was planted to nuts; a good many of the walnuts being imported from California. The almonds and walnuts were planted alternately in the rows, so that later, when the walnuts require more space, the almonds can be removed. A row of almonds has been planted as a wind-break along the inside of the avenue fence, in front of the vines and fruit trees.

Sixteen acres of assorted fruit trees have been planted. About 168 fig-trees have been planted, consisting of eleven varieties, which comprise chiefly Smyrna and Capri varieties, the latter to provide the wasp for fertilising the Smyrna varieties. The following list shows the number of varieties of each different fruit which is planted, viz.:—

Apples	26	varieties.	Almonds	6	varieties.
Apricots	20	,,	Walnuts	6	,,
Cherries	9	,,	Grapes	26	,,
Lemons	6	,,	Quinces	6	,,
Loquats	6	,,	Oranges	13	,,
Mulberries	3	,,	Citrons	3	,,
Olives	5	,,	Shaddocks	2	,,

Each of the blocks is divided by a row of olives and an irrigation ditch, and the orchard and vineyard is to be surrounded by a 6-foot wire netting fence with a break-wind consisting of three rows of trees, as follows: Sugar Gums, Oriental Planes, and Kurrajongs on the south and west, while on the eastern side Blue-gums alone are planted. These are to be used for firewood later, as they usually sprout readily after being cut down. They have proved very valuable in California for such, and we wish to find out if they will do equally well here when grown under irrigation.

The avenue is 99 feet wide, and is laid out as follows: A row of palms (chiefly *Phœnix canariensis*), down the centre, while at either side and 15 feet from the fence are rows of Silky Oaks (*Grevillea robusta*) and Kurrajongs. Sugar Gums and Kurrajongs are planted on the north of the cultivation area, while on the west are Sugar Gums, Oriental Planes, Kurrajongs, and a few other ornamental trees. Unfortunately all of our trees and palms for the avenue were very small, and it will take them some time before they are large enough to make a good show, but when they are grown it will be one of the prettiest drives in Australia.



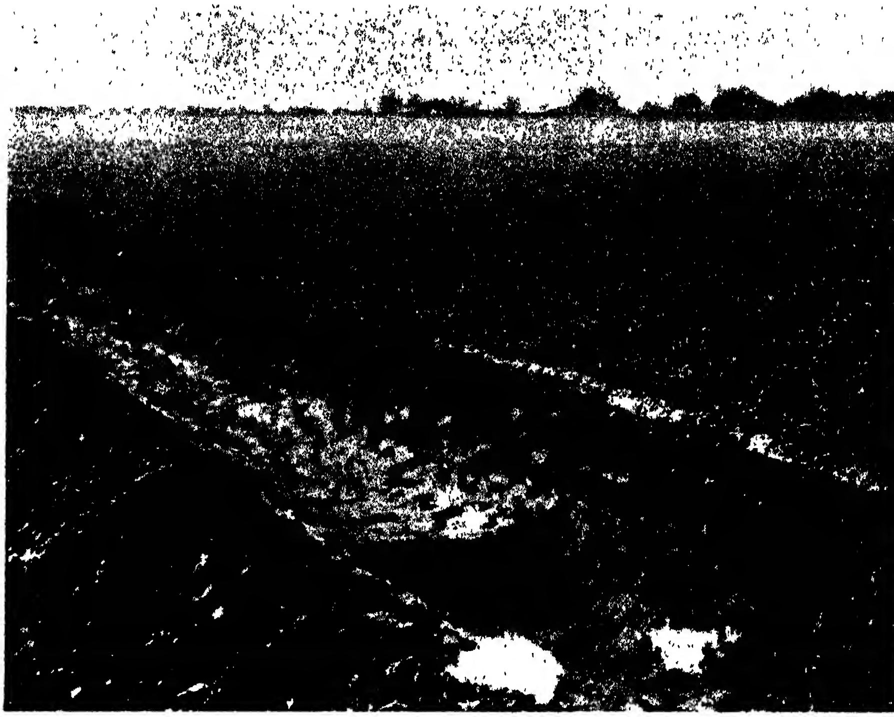
Posts ready to receive 6-foot wire netting; and row of young almond trees along the front of the orchard.

The first building to be erected was a shed for the implements and a stable for the horses; then two workmen's cottages were erected; and a hay-shed, 30 feet x 60 feet, is now nearing completion.

The farm is at present being worked by six young horses, which were purchased a few months ago. We have already two foals, and we hope to breed a few each year.

Leather harness, collars and reins, are being used, special hooks on the whiffletrees, and patent clips in place of buckles on the traces are in use. Rope reins and plough chains will not be used on this farm.

The implements at present in use on the farm consist of seed-drill, spring-tooth cultivator, double-disc harrow, two single-furrow ploughs, lever-



Hay crops.

harrow, smoother, buckscraper, and home-made crowder for making channels. We have also an anvil and blacksmithing tools, and the necessary carpenter's outfit.

A good strong spring cart and a serviceable waggon have also been added to our stock—in fact, we are by degrees emerging from the pioneering stage, as we are purchasing the implements required to run an equipped farm, as necessity arises. Our crops are coming on, and we will shortly add a reaper and binder and mowing machine, a horse rake and necessary hay rack, to our list The latter will be made on the place.

The engine and pump are installed, and the first water was turned into our channels on the 29th September, and into the furrows in the orchard on the

Stable, Implement Shed, and Chaff and Harness Room.

30th September. The orchard and vineyard are to be irrigated first, after which the hay crops will receive attention. The orange trees and palms will be planted during the first irrigation in the latter part of October. The source of our water supply is about two and a half miles away from the farm, and by kind permission of Sir Samuel McCaughey we were allowed to erect our pump on the same stand as one of his is standing, and to pump out of one of his billabongs into one of his channels, which delivers the water to within about three-quarters of a mile of our country. The land lends itself readily to irrigation, having a nice fall two ways. The cost of grading the land was very low, not exceeding £1 an acre.

Workmen who have been employed in laying out and planting the orchard, and putting in crops, fencing, &c., and carpenters who have put up the buildings, together with implements used on the station.

The crops of wheat, oats and barley are looking well, and promise a fair crop of hay. Sorghums, corn and other summer crops are being planted as fast as time permits, and by the fall we expect to make quite a show of the first fruits of this the beginning of the Great Murrumbidgee Irrigation Scheme.

To one who has spent ten years in California, and about eighteen years among irrigation works in this country, there appears to be every indication of a very bright future for this part of the State with the advent of the water. The system of applying the water at this farm is the same as I have described in previous articles, that is, the furrow system for trees and vines, sorghum, maize, &c., and flooding for the lucerne.

Market for New South Wales Honey in Great Britain.

As the result of inquiries that he had received from time to time, the Agent-General asked—in September, 1907—that he might be supplied with a few samples of New South Wales honey, with a view to testing the London market. The Intelligence Department accordingly communicated with the leading apiarists, with the result that five different samples of New South Wales honey were forwarded to the Agent-General, who has now submitted reports to the Premier. The following extracts are published for general information :—

26th June, 1908.

I have the honor to inform you that I am giving special attention to the question of finding a remunerative market for New South Wales honey, samples of which reached me last week. I submitted samples to several of the leading buyers in Great Britain, amongst whom were Messrs. Lipton, Lyons, Sainsbury, and Crosse and Blackwell. I am pleased to be able to say that all who have tested the honey speak very highly of its quality. They rank it as quite equal to the South Australian honey, and some of the samples sent as superior thereto. I have not yet taken steps to test prices, as under the conditions under which the South Australian trade is conducted I am afraid the price obtained for that honey will dominate the market for all Australian honey. The position taken up by South Australia may be gathered by a speech made to the Bee-keepers' Conference yesterday by Major Norton, commercial agent for that State. Speaking of the honey exported by his State, he said : "They did not wish to compete with home production, but to popularise the commodity as a food. The more they could create a demand, the better it would be for the English bee-keeper."

South Australian honey is sold wholesale here at such price that 1 lb can be purchased in a glass jar with screw top, retail for 6d., and I presume, therefore, that this honey is sold to wholesale firms at not more than 2½d. per lb. In the circumstances, I do not think it would be possible to put New South Wales honey commercially on this market. So long as South Australia is engaged in the work of popularising honey, I think it would be wise if we refrained from exporting, unless, indeed, we can come to an agreement with the South Australian Government or exporters to charge a more remunerative price for the commodity. South Australian honey is certainly as good as the bulk of the honey retailed in London—in fact, I should say it is superior to any but the best British. Nevertheless, South Australian honey is retailed 6d. per lb., while Jamaica honey fetches 9d., New Zealand 10d., and British honeys from 10d. to 1s. per lb. I do not, however, think the outlook for Australia is at all bad. Honey is not largely consumed in England ; first, because when it is good it is dear, and when it is cheap it is much adulterated. The taste for pure honey is certainly growing, and if the Australian growers would combine to fix a remunerative price, and one not too high for the general consumer in London, I think good business might be looked forward to.

During the course of next week, I shall take an opportunity of conferring with the South Australian and Queensland authorities here, in order to ascertain their views as to price, and let you know the result as soon as I am able to do so.

Sir, 3rd July, 1908.

With reference to my letter of the 26th June, regarding the samples of honey forwarded to me by the Intelligence Department for the purpose of inquiring if trade could be done, I have the honor to inform you that I have made exhaustive investigation and find that although the honey is well thought of by the trade, the highest definite offers for it are 25s. per cwt., c.i.f. London, for No. 1 sample, and 23s. per cwt. for No. 4, under the same conditions, for 5 tons and 3 tons respectively. These offers were made by Messrs. Batger & Company, and Liptons, Ltd., respectively.

As pointed out in my previous letter, these low prices are largely the result of 6d. per lb. having been established as a retail maximum price for choice South Australian honey.

Comparatively speaking, there is not a large quantity of honey consumed in Great Britain, and stocks take a long time to clear. Buyers say that with a 6d. standard for retail price they cannot pay more than 2½d. per lb. wholesale, for after they have paid 1d. per lb. for handling, bottles, &c., the retailers' margin of profit is not great on an article like honey, which is not of quick sale. Confectioners use fair quantities of honey for manufacturing purposes.

The samples sent were submitted to twenty of the most prominent and influential wholesale honey merchants, retail distributors, manufacturing confectioners, as well as two or three of the honey brokers. Their opinions varied widely, not only in regard to quality, but also as to probable prices which could be realised here. After weighing them all up carefully it seems probable that there is a market to be found here for New South Wales honey, and probably 300 to 500 tons could be sold in a season, provided the prices obtainable on the home market would be sufficiently attractive to New South Wales bee-farmers. I had numerous offers and orders for sample lots as test shipments, but I only mention the following, which are the best :—

Batger & Co.—5 tons No. 1, at £25 per ton, c.i.f. London.

Clark, Richards, and Coombes, Ltd.—1 ton No. 4 (equal sample), c.i.f. London, prompt shipment, at 22s. per cwt.

Liptons, Ltd.– 3 tons No. 4, at 23s. per cwt., c.i f. London, prompt shipment.

Eagle Confectionery Co.—1 cwt. No. 2, at 24s. per cwt., prompt shipment.

Callard and Bowser.—1 cwt. of Nos. 1 or 2, at 24s. per cwt., prompt shipment.

Some of the firms interviewed informed me that honey of Australian origin had been sold on the Mincing Lane markets at 14s to 16s per cwt., but the quality was not, of course, as good as, say, No. 4 sample, or No. 1 and No. 2. On the other hand Jamaica of fair to inferior quality has been sold at somewhere in the same region of price. Merchants and others handling honey are generally prejudiced against Australian honey, and state that on the English markets English and Scotch honey rank first, Narbonne French honey next, then Californian and New Zealand (the best of which is highly appreciated on this market), then Jamaica, of which there are all qualities obtainable, from inferior to fine; then they place Australian. Handlers here are very much afraid of the prejudice against Australian honey, because it is popularly supposed to be flavoured with eucalyptus. In this connection the firms to whom I submitted the samples expressed diversity of opinion, some stating that the honey submitted had a slight trace of eucalyptus, others said there was no trace of eucalyptus flavour; in addition to which, one firm expressed the opinion that sample No. 5 had a slight trace of tallowy flavour I only mention this to show the diverse views expressed.

There was a decided concensus of opinion that No. 1 was the best, but the value of this would undoubtedly be enhanced if it was set white. Then No. 4 sample was very favourably commented upon as being of fairly good flavour, and it seems as if quality of this sample to a little better would sell readily at about £22 to £23 per ton. One sample, whilst fairly good honey, was, unfortunately, fermented, and consequently of very little commercial value. Merchants, one and all, impressed the necessity for bee-keepers to use only clean, bright tins, otherwise the honey becomes discoloured, and may deteriorate and cause disappointment to shippers in the price realised; and in connection with the whole business it must be understood that shippers guarantee the honey as absolutely pure. Some of the firms thought that No. 3 was too syrupy.

I attach a list of some of the firms called upon, together with their expression of opinion, and I may say, as far as possible, I am only submitting to you reports originating from people in whom I have the utmost confidence, and I therefore think these reports may be taken as sound and commercially valuable.

I may add that the autumn and winter are the best seasons for disposing of fairly large quantities of honey on these markets.

Report from Messrs. Clarke, Nicholls, and Coombes.

This firm will take 1 ton of No. 4 sample at 22s. per cwt. (not more) as this is the price paid by them for Jamaica honey lately.

The honey buyer, Mr. Matheson, is of opinion that all the honey is of a better class than the ordinary run of Australian honey. The red honey he values at 20s. to 21s., but thinks if they could be drawn white they would fetch 30s. to 31s per cwt.

Report from Messrs. Callard and Bowser.

This firm will take 1 cwt. as a sample of either No. 1 or No. 2 sample, at 24s. per cwt.

Report from Mr. F. J. Carmichael.

These people say they would like to see actual dock samples if they come in. Honey was sold this week (26/6/08) at Mincing Lane, Australian liquid and set, at 15s. to 15s. 6d per cwt.

Report from Messrs. Doulton and Young.

The samples submitted to them were classed into three grades. The flavour is superior to the usual run of Australian honey. They sold 100 cases of West Australian honey on 15th June, 1908, from dark to pale colour, at 14s. to 15s. per cwt.

Report from Messrs. E. and T. Pink, Staple-street.

Mr. Comin says the Australian honey is by far the best he has handled, but as he has bought his stock for a month or two, he regrets that he could not buy just now, but he will be pleased to see any honey we may have on hand. No. 1 sample he thinks ought to fetch 32s. per cwt.

Report from Messrs. Petty, Wood, & Co.

No. 5 sample worth, perhaps, 28s. per cwt.; No. 1 sample worth, perhaps, 26s. per cwt. They think that the honey has a eucalyptus flavour. No. 3 sample good honey; eucalyptus flavour hardly noticeable.

Report from Messrs. Pascall, Blackfriars-road.

The honey is good for Australian, but there is a peculiar flavour in them that would be harmful to the class of confectionery they use.

Report from T. Smith, Cambridge-street, Edgware-road.

Sample No. 1 is the finest honey in the lot, and he thinks it is fit for the English market. He is to blend A1 with some English honey, and if the result is satisfactory he will take a quantity. He prices No. 1 sample at 25s. per cwt.

Report from Messrs. Sharwood & Co., Ltd.

The samples left with this firm are to be tested by their chemist, and they will let us know what their decision is. Three of the samples they price at 25s., 24s., and 25s. per cwt. each.

Report from Messrs. Lyons & Co., Ltd.

We handle some Australian honey, but we do so only on a small scale, and regret we cannot take up a fresh line of these goods. Unfortunately, the flavour and smell of Australian honey are not popular with the British public. We find a much more ready sale of honey of a pleasing nature, which we are afraid from our inquiries cannot be produced in Australia.

The Co-operative Marketing of Citrus Fruits.

The California Fruit-Growers' Exchange.

The Honorable the Minister for Agriculture is in receipt of a letter from Mr. A. Downe, a resident of Los Angeles, California, who recently visited New South Wales, and made a careful inspection of the citrus groves of the County of Cumberland. Mr. Downe has an orchard of some 24 acres at Duarte, California, and can therefore speak as a fruit-grower to fruit-growers. Mr. Downe refers to the prevalence of fumigating with cyanide in preference to spraying, declaring that the latter process has been abandoned, as it causes "die-back" of the fine twigs and sprouts.

The freight from California to New York is 4s. 6d. per 100 lb. box a distance of 3,000 miles.

Oranges are shipped east to New York and London and throughout Canada, and arrive in good condition.

The new crop for next year promises to be a heavy one, probably the heaviest for years, due no doubt, Mr. Downe says, to liberal fertilising and fumigating.

The marketing of the enormous crop is as important as growing it, and California fruit-growers have established the California Fruit-Growers' Exchange to perform this work. As there is nothing of this kind in existence in this State, the need of such a corporation was apparent to Mr. Downe; he has therefore been to no little trouble in collecting information on the subject. From a pamphlet issued by the California Fruit-Growers' Exchange forwarded by Mr. Downe the following is taken :—

"Twenty-five years ago the annual total shipments were scarcely twenty carloads. Fifteen years ago the annual shipments were approximately 4,000 carloads, or slightly in excess of a million and a quarter boxes (a box holds 2 cubic feet).

"Since that time there has been an increase from year to year, until the average of the last three seasons has reached the vast volume of 30,000 carloads, or 11,000,000 boxes yearly. The net f.o.b. value of the crop of 1906 has been conservatively estimated at twenty million dollars.

"When citrus fruit-growing in California emerged from the stage of experiment and pastime into that of profit-seeking, the problem of marketing immediately confronted the growers. They were thousands of miles from the populous centres in which their fruit must find consumers, and they had practically no home markets nor agencies through which they could convert it into ready money at remunerative figures. It is true there were speculators in the field, but their offers to buy were at very low prices, and only spasmodic at best. This is not strange, as the speculators were but go-betweens, and the markets being undeveloped, they could only offer for the most part to take the fruit on consignment for grower's account. If passing the speculator by, the grower sought relief by consigning his produce to the market himself,

he was little, if any, the gainer. These were the conditions in the early nineties, when the citrus fruits of California orchards were less than one-tenth the present value.

"Various expedients were resorted to for the betterment of these conditions. Speculators attempted to form a compact to apportion among themselves the territory where the fruit was grown, to fix maximum prices to be paid for fruit, and also to establish f.o.b. prices, regulate credits and equalise distribution in consuming markets. Growers and speculators together sought to regulate prices, consignments, and other important questions. The most disastrous year so far as net returns were concerned that the citrus fruit industry in this State has ever experienced was 1892–3. In Riverside and all other sections, where there was any quantity of fruit to ship at that time, account sales in "red ink" were received without number. In many instances growers not only furnished their entire crops for nothing, but were also required to pay freight and packing charges, which the gross sale of their fruit did not cover. All of these efforts to improve marketing conditions were inadequate and short-lived. In the very nature of things they could not be more than partially successful, since the interests of growers and speculators are necessarily divergent on important points. In several localities a few growers had associated themselves to secure better packing facilities, and for mutual protection. In some instances these associations had marketed on a mutual basis.

"As a result of the above-mentioned failure of speculative shifters to sell the year's crop at fair prices, and particularly stimulated by the association experiences, a large percentage of growers sought to solve the vexed problem by an enlargement of the association idea.

"A convention of growers assembled at the Chamber of Commerce, Los Angeles, on the 4th April, 1903, the declared purpose of the meeting being:

"To provide for marketing of all the citrus fruit at the lowest possible cost under uniform methods, and in a manner to secure to each grower a certain marketing of his fruit, and the full average price to be obtained in the market for the entire season."

"Following the recommendations of this convention of growers, organisation of associations and district exchanges was effected in all the principal citrus fruit districts, the packing to be done by the association at cost, and the marketing through an executive committee, composed of one member from each district. This arrangement for the marketing of the fruit continued during two seasons, viz., those of 1893–4 and 1894–5, but not being entirely satisfactory, on October 21, 1895, the Southern California Fruit Exchange was organised, since which date the marketing of the fruit controlled by the various district exchanges and their associations has been exclusively in the hands of the Southern California Fruit Exchange, and its successor, the California Fruit-Growers' Exchange, except during the period of seventeen months, from April 1, 1903, to August 31, 1904, during which time the Exchange interests combined in the sale of their fruit with the principal non-Exchange shipping interests under the name of the California Fruit Agency. The net results obtained during the Agency period were not satisfactory to the growers, and on September 1, 1904, the Exchange resumed the sale of the fruit it controlled, independently of any other factor.

"On resuming its marketing operations, the Exchange passed the following resolution as a basis on which to operate:

On May 20th, we issued a circular advising all growers of the dissolution of the California Fruit Agency, to take effect September 1st next.

Upon the formation of the California Fruit Agency, every effort was made to sell the fruit f.o.b. California. All agents were instructed to push this policy, and men were employed as salesmen in the Sales Department of the Agency who possessed ability and much experience in that line, and who have been in the employ of the leading packers, as their salesmen, for many years.

Immediately after the California Fruit Agency was organized, April 1, 1903, f.o.b. orders for fruit (usual terms of. inspection, etc.) were only received in limited numbers and not sufficient to move a reasonable percentage of the crop—although climatic conditions, in California were most favourable to restrict shipments. It soon became necessary, in order to move the crop, to ship, and attempt to make sales in transit, or sell the fruit delivered at market value at the point and time of delivery.

Our crops are now so large that all markets should be constantly supplied with their full quota of fruit in order to consume the output. This distribution can be better accomplished by those most directly interested,—the growers themselves. The citrus fruit-grower is no longer independent of his neighbour as to marketing his crop, but each one is dependent upon the other, especially in so far as systematic distribution is concerned.

The Southern California Fruit Exchange is composed only of growers, who recognise all legitimate dealers in the trade, and who are organised for the purpose of disposing of their products in all markets of the country upon the most advantageous terms, and to secure distribution to the trade at the least expense compatible with the best service, securing to the consumer the fruit at reasonable prices, and to the grower the best average returns.

When the Southern California Fruit Exchange resumes its selling operations on September 1st next, in the absence of other instructions from, or a change of policy being inaugurated by the growers themselves, through their representatives on its Board of Directors, the Management will endeavour to sell the fruit in such a manner as will bring the *most money for the product* confining itself neither to cash sales in California, f.o.b. sales California (subject to inspection, draft attached to bill of lading), or sales delivered, nor to any other one method. Its agents and representatives will be instructed to secure all orders possible for fruit, allowing the customer to take his preference as to whether he wants these orders to be for spot cash, f.o.b., usual terms, or delivered, subject of course to the confirmation of the Exchange or Association shipping.

Growers or Associations of growers not connected with the Southern California Fruit Exchange have the opportunity now to associate, or to form new associations according to their preference and to conditions existing in their localities.

Believing that in co-operation with each other, the best net results to the growers can be obtained, we appeal to all present Exchange members and others interested in maintaining values of orchard property to put forth every effort to secure as large a membership as possible in our associations and exchanges.

"On March 27, 1905, the California Fruit-Growers' Exchange was incorporated, and on September 1st following succeeded to the business of the Southern California Fruit Exchange. This change in name being deemed advisable in order that the marketing organisation itself might in name, as well as in fact, become general throughout the state rather than remain local to Southern California.

"The Exchange was founded upon the theory that every member was entitled to furnish his *pro rata* of the fruit for shipment through his associations, and every association to its *pro rata* of the various markets of the country. This theory reduced to practice gives every grower his fair share, and the average price of all markets throughout the season.

"Another cardinal provision of the plan was that all fruit should be marketed on a level basis of actual cost, with all books and accounts open for inspection at the pleasure of the members. These broad principles of full co-operation constitute the basis of the Exchange movement.

"The Exchange system is simple, but quite democratic. The local association consists of a number of growers contiguously situated, who unite themselves for the purpose of preparing their fruit for market on a co-operative basis. They establish their own brands, make such rules as they may agree

upon for grading, packing, and pooling their fruit. Usually these associations own thoroughly equipped packing-houses.

"All members are given a like privilege to pick and deliver fruit to the packing-house, where it is weighed in and properly receipted for. Every grower's fruit is separated into different grades, according to quality, and usually thereafter it goes into the common pool, and in due course takes its percentage of the returns according to grade.

"Any given brand is the exclusive property of the Association using it, and the fruit under this brand is always packed in the same locality, and therefore of uniform quality. This is of great advantage in marketing, as the trade soon learns that the pack is reliable.

"There are more than eighty associations; covering every citrus fruit district in California, and packing nearly two hundred reliable and guaranteed brands of oranges and lemons.

"The several associations in a locality unite to form the local Exchange, which serves as a medium, and to a certain extent as a buffer between the associations and the general Exchange.

"Questions of purely local interest, and many real or supposed grievances are disposed of in the local Exchange, and through it more important matters reach the general Exchange.

"The California Fruit-Growers' Exchange, referred to above as the General Exchange, consists of thirteen stockholders, all directors, and all selected by the local Exchanges. In other words, the several local Exchanges designate one man each from their membership as their representative, and he is elected a director of the California Fruit-Growers' Exchange. By this method the policy-making and governing power of the organisation remains in the hands of the local Exchanges.

"From top to bottom the organisation is planned, dominated, and in general detail controlled absolutely by the fruit-growers, and for the common good of all members. No corporation or individual reaps from it either dividends or private gain.

"So far we have dealt almost exclusively with the organisation of the Exchange, its co-operative aspects, and general policy at home. Equally important is its organisation in the markets.

"Seeking to free itself from the shifting influences of speculative trading, by taking the business out of the hands of middlemen at home, the Exchange found it quite as important to maintain the control of its own affairs in the markets. It never contemplated the opening of either retail or jobbing houses, but to put the fruit into the hands of the legitimate dealers first hand. For this purpose the Exchange established a system of exclusive agencies in all the principal cities of the country, employing as agents active, capable young men of experience in the fruit business. Most of these agents are salaried, and have no other business of any kind to engage their attention, and none of the Exchange representatives handle any other citrus fruits. These agents sell to smaller cities contiguous to their headquarters, or in the territory covered by their districts.

"Over all these agencies are two general or travelling agents, with authority to supervise and check up the various offices. These general agents maintain in their offices at Chicago and Omaha, a complete bureau of information, through which all agents receive every day detailed information as to sales of Exchange fruit in other markets the previous day. Possessing this data the selling agent cannot be taken advantage of as to prices. If any agent finds

his market sluggish, and is unable to sell at the average prices prevailing elsewhere, he promptly advises the head office in Los Angeles, and sufficient fruit is diverted from his market to relieve it and restore prices to normal level. In actual practice approximately 40 per cent. of all the fruits shipped by the Exchange is sold by public auction at point of consumption, and of the remaining 60 per cent. the greater part is sold at private sale at a price agreed upon between the seller and purchaser at point of arrival on market conditions as they prevail at that time. Through these agencies of its own the Exchange is able to get and transmit to its members the most trustworthy information regarding market conditions, visible supplies, &c. This system affords a maximum of good service at a minimum cost. The volume of the business is so large that a most thorough equipment is maintained at a much less cost to growers than any other selling agency can offer.

"During the fourteen years of co-operation in the marketing of citrus fruits under the Exchange system, the output of the State has increased from 4,100 cars in 1892-3 to 31,791 cars (including Northern California shipments) during the season of 1904-5, with a prospect of a still further increase in in the volume of shipments in the very near future.

"Marketing the fruit for its growers at actual cost, the Exchange has been able to bring about a great reduction in packing and selling charges, with the result that the average cost per box of both packing and marketing oranges to Exchange growers has during recent years averaged around 35c. as against 75c. per box at the time the Exchange was organised, when the charges by speculative shippers for packing alone was 40c. to 50c. per box, to which was added for selling 7 to 10 per cent. commission on the delivered price.

"This co-operative movement is no longer an experiment. Organised upon lines materially differing from any other co-operative organisation, all the details had to be worked out with extreme care and caution. To have failed would have been to utterly demoralise the citrus fruit industry, as there were no other adequate marketing facilities. Serious blunders in the execution of the plan would have been almost equally disastrous. Naturally this growers' organisation has met with very strenuous and, in some instances, bitter opposition from the speculative elements in the fruit trade

"The Exchange is not a Trust. It neither seeks to control production, nor arbitrarily to fix prices. It does, of course, undertake so far as possible, by a simple method of co-operation, to displace the competition of one grower with another in the matter of packing and marketing their fruit. By purely economical, as distinguished from trust methods, it ensures to every grower the full reward of growing good fruit, and to every association the benefit of good grading and packing."

Veterinary Notes.

JAS. D. STEWART, M.R.C.V.S.,
Chief Inspector of Stock.

Injurious Effects of Wild Tobacco Plants.

During last July a mob of 1,380 bullocks were being travelled from Murrawombie, near Mungindi, to Muswellbrook. When nearing Narrabri a number of the bullocks were noticed to present signs of sickness, and three head had to be dropped at the Ironbarks, near Narrabri, one of which died soon afterwards. The symptoms of an affected beast were reported as follow:—Animal emaciated, limbs affected and consequent staggering gait, eyes prominent, ears slightly lopped, no discharge from nostrils, and no sign of cough even after the beast had run some distance. Before death the beast lost power of its limbs and seemed to stretch out its legs as if paralysed.

The trouble was thought by the drover to be "pleuro," but a *post-mortem* examination by Mr. Stock Inspector Brackenreg revealed not the slightest sign of pleuro or of any specific disease. The stomach and intestines were, however, very much inflamed, apparently due to the effects of an irritant poison. A search was made for poison plant, and the rumen was found to contain portions of a plant which resembled very much the native tobacco plant.

A month later, a mob of 1,095 bullocks travelling from Beaufort, Queensland, to Muswellbrook met with similar misfortune when within about 10 miles of Narrabri. Fully 100 head showed signs of illness, and four deaths occurred. The symptoms shown by these cattle were exactly similar to those of the mob in charge of Drover Barnett, and the evidence forthcoming clearly proved the cause of the mortality to be due to the poisonous effects of the tobacco plant (*Nicotiana suaveolens*). The eradication of this plant from the stock reserve is being strongly advocated, and in the meantime the Stock Inspector has caused notices to be posted at prominent places warning drovers of its existence on the reserve.

Mortality in Pregnant Ewes (Parturient Apoplexy).

Owing to the drought conditions experienced in various parts of the State during the past season and the consequent shortage of grass, owners were compelled to resort to scrub-feeding their sheep, which, in the case of pregnant ewes, was responsible for many deaths. The actual cause of death was really a form of parturient apoplexy, and is usually excited by the following combination of factors:—

1. The mating of constitutionally weak or aged merino ewes with vigorous Shropshire or Lincoln rams.
2. Insufficient sustenance at the critical period of gestation, *i.e.*, during the month prior to lambing.
3. Want of proper attention during lambing.

The common result of mating vigorous young Shropshire or Lincoln rams with merino ewes is multiple fecundation, viz., twin or triplet lambs, and unless the ewes have a good constitution and are left undisturbed on good pastures during the latter period of pregnancy, the nervous system becomes deranged and the animals suffer apoplectic seizure. Many owners have not yet realised that the same liberties cannot be taken with cross-breeding as in the case of breeding of pure merinos, and therefore they do not devote the necessary attention to the ewes during their critical period.

When ewes in advanced pregnancy are indicating symptoms of nervous derangement, such as giddiness, peculiar high erratic movements of the legs, staring appearance in eyes, and convulsions followed by a comatose or sleepy condition, during which they grind their teeth and discharge a greenish fluid from their nostrils, the most satisfactory measures to adopt are to bleed from tail, ear, or eye vein; the administration of a purgative up to 2 ounces of Epsom salts, or a wine-glassful of castor oil, followed by an allowance of nutritious food (green and succulent, if practicable), and a liberal supply of water.

Until the ewes have lambed and the lambs strong and suckling well, they should not be driven or exposed to hardships of any kind.

Outbreak of Mortality among Stock in Candelo District.

Recently a somewhat mysterious disease was reported to have broken out amongst the dairy herds in the Candelo district, which caused the owners of infected herds in that locality serious alarm.

The Stock Inspector for the district (Mr. C. O. Furniss) was directed to investigate the cause of the mortality. As a result he reported that infected animals were noticed to have ceased feeding, and stood about in a listless, tucked-up manner, back slightly humped, movements cramped, and occasionally looking round to side as if in pain. The trouble lasted from one to four days, when the animals died without a struggle. *Post-mortem* examination revealed that the fourth stomach and intestines appeared normal but empty. Contents of first stomach were ferns, blady grass, dead leaves, and some grass. The third stomach was impacted and the contents hard and dry, while the whole stomach showed considerable inflammation. With these exceptions the organs were in a more or less healthy condition.

There is no doubt that the mortality was due to impaction of the third stomach, consequent upon the dry, hard feed, as a result of the long drought experienced in that part of the State. In many cases the climax was hastened owing to many of the animals being heavy in calf.

Upwards of twenty deaths occurred in the district, and in all cases the carcasses were in an emaciated condition. Splendid rains have recently fallen, and the young grass is shooting rapidly, affording the stock a nibble of green, succulent feed. The mortality has now abated.

METEOROLOGICAL BUREAU, NO. 4 DIVISION,
NEW SOUTH WALES.

Weather Conditions during September, 1908.

S. WILSON,
Divisional Officer.

ON the 1st of the month, an antarctic disturbance covered South Australia and a great portion of New South Wales and Victoria. At 9 a.m. on the following day the isobaric chart showed that this depression was but a portion of a very extensive low-pressure belt stretching for at least the whole length of the southern shores of the continent. The lowest barometric value was 29·5 inches between Gabo and Swansea (Tasmania).

Within the next forty-eight hours some intensification occurred in the "Col" or narrow neck of low pressure between two adjacent anticyclones. This "Col" was very extensive, stretching from the Gulf of Carpentaria, in Northern Australia, to the south coast of Victoria.

During the first week, the weather with the above pressure distribution, especially over South Australia, varied between fine and frosty to showery conditions, with light to strong north-west to south-west winds and smooth to rough seas. Associated with the depression, thunder and hail-storms and snow were reported from several places along the southern seaboard. Light to heavy rainfall was recorded in the south-eastern States. The heaviest falls during the week occurred in parts of Victoria. Natimuk, on the 1st, had 250 points, Dunkeld 257, and Dimboola 225. In South Australia the amounts were light to heavy south of Farina, including the north-eastern pastoral country. Melrose had 155 points, Spalding 145, and Watervale 136 points. In New South Wales, Tumberumba recorded 140 points, Kiandra 132, Tumut 110, Adelong 107, Albury 98, and Jerilderie 94.

At 9 a.m. on the 5th, a closed-curve depression occupied New South Wales and Victoria, having developed from the "Col" above mentioned. Splendid rains associated with thunderstorms resulted generally over our State east from the Darling. The heaviest amounts were 315 points at Nimitybelle, 301 at Gabo, 260 at Cooma, 255 at Bega, 245 at Adaminaby, 239 at Bombala, and 230 at Delegate. The remainder of the falls ranged from a few points to nearly 2 inches.

In Victoria, light to heavy amounts were recorded over the eastern half, and light and isolated over the north and north-west. Light to heavy falls were also registered in the coastal districts of Queensland south from the tropics, including the central and eastern downs.

Within the next forty-eight hours, the pressure system had travelled slowly eastward, the depression at 9 a.m. on the 7th being shown just off the coast of New South Wales where fresh to strong south to south-west winds were blowing, and slight to rough seas obtained. Otherwise the continent was covered by an extensive anticyclone, with its highest readings over the

Central and Southern Districts. Fine weather ruled for the most part, with the exception of extensive cloud areas over coastal districts, and a few isolated showers.

By 9 a.m. on the 8th, the anticyclone had worked north-eastward, thus giving inducement to the northward expansion of the outer isobars of a very extensive depression located in the Southern Ocean. Fresh to strong north-west to westerly winds resulted between Streaky Bay and Gabo, with slight to rough seas. Cloudy conditions still persisted over the southern shores of Australia, but otherwise the weather was fine throughout. On the 9th the high pressure had assumed an elongated appearance, lying east to west, whilst the antartic disturbance had steepened considerably, with its isobars arranged horizontally over Victoria and Tasmania. As a consequence, winds strengthened from the west to the force of a fresh gale, and seas became more disturbed in and about the Straits. These unsettled conditions were displaced from the south-east corner of the continent by a southern expansion of the high pressure as it moved forward and assured fine and milder weather over the eastern half of Australia. Within the following twenty-four hours this high pressure worked over to the eastern districts, and permitted the expansion eastward of another depression, which at 9 a.m. on the 11th, covered the south-west quadrant of the continent.

The highest and lowest temperatures registered between the 4th and the 11th over the various subdivisions of the State were as follow :—

Western Division ...	85	degrees at	Bourke... ...	33	degrees at	Balranald
North-western Plain	81	,,	Walgett ...	37	,,	Moree
Central-western Plain	80	,,	Coonamble ...	28	,,	Carinda
Riverina	78	,,	and	31	,,	Hay
North-western Slope	80	,,	Bingara ...	31	,,	Warialda
Central-western Slope	78	,,	Dubbo	27	,,	Coolah
South-western Slope	73	,,	Germanton ...	31	,,	Murrumburrah
Northern Tableland	77	,,	Tenterfield ...	33	,,	Glen Innes
Central Tableland	75	,,	Mudgee ...	29	,,	Carcoar
Southern Tableland	66	,,	Goulburn ...	22	,,	Kiandra
North Coast ...	82	,,	Grafton ...	42	,,	Kempsey
Hunter and Manning	80	,,	Jerry's Plains ..	35	,,	Murrurundi
Metropolitan . .	79		and	41	at Parramatta	
South Coast ...	78	,,	Picton	35	degrees at Picton	

Between the 11th and 18th, two anticylones and two antarctic depressions were shown on the isobaric chart, the general effect of their passage over the continent being alternate experiences of warmth and cold, as also fine and wet weather.

On the 11th, a very extensive "high" was just leaving the mainland of Australia by way of the eastern districts of Queensland and the north-west quadrant of New South Wales. Following closely on this departing anticyclone was an energetic depression, whose northern limits reached as far inland as Alice Springs, and which covered the greater part of the south-eastern States. Unsettled weather, associated with thunder, was experienced generally east from the Darling, some of the falls exceeding 1 inch in the Central and Southern Slopes and Tablelands, Kiandra had 136 points, Orange, 117, Crookwell, 104, and Rockley, 109; the other amounts ranged from a few points to three-quarters of an inch. On the same day another

high pressure had made its appearance over West Australia, and by the 14th its advance isobars had shot 1,500 miles in a north-east direction to the central coast of Queensland. These isobars exhibited a series of kinks as they proceeded over New South Wales, and upon reaching the coast, on the 15th and 16th, assisted in the development of the severe rain-squalls and rough seas along the seaboard, as also the "cold snap" experienced during that season.

These conditions passed off the mainland by way of the North Coast by the 15th, and after a brief spell of fine weather attending the passage over of the anticyclone, more unsettled weather developed over the south-western area and on the coast, as the result of the proximity of a rapidly-moving antarctic depression.

The highest and lowest temperatures registered in the various districts during the week ended the 18th, were as follow:—

Western Division ...	Bourke	91 deg.	Wentworth ...	24 deg.
North-western Plains ...	Walgett. 83 deg and	30 ,,		
Central-western Plain ...	Carinda 84 deg. and	28 ,,		
Riverina	Hay	83 ,,	Narrandera ..	26 ,,
North-western Slopes ...	Narrabri	79 ,,	Warialda and Quirindi, each...	31 ,,
Central-western Slopes...	Dubbo	77 ,,	Coolah	25 ,,
South-western Slopes ...	Barmedman ...	77 ,,	Cootamundra and Murrumburrah.	26 ,,
Northern Tableand ...	Tabulam	79 ,,	Glen Innes & Inverell	26 ,,
Central Tableland ...	Cowra	78 ,,	Carcoar	26 ,,
Southern Tableland ...	Braidwood ...	72 ,,	Kiandra	18 ,,
North Coast	Lismore	87 ,,	Casino	38 ,,
Hunter and Manning ...	Maitland and Camden Haven.	80 ,,	Scone	28 ,,
Metropolitan	Parramatta ... 78 and	36 ,,		
South Coast	Bodalla	76 ,,	Bowral	28 ,,

At 9 a.m. on the 19th, an extensive and energetic antarctic disturbance covered the south-eastern States, and during the following forty-eight hours was responsible for very stormy conditions over a great area. The winds in various districts reached the force of fresh to strong gales, and light to heavy rainfall, associated with hail, was experienced almost generally east from the Darling.

As the depression worked eastward, cold conditions set in, and many places reported minimum temperatures below the freezing-point. Snow also occurred at scattered places on the highlands. In the city a westerly gale with strong squalls commenced at 5 a.m. on the 20th, one of the squalls registering a velocity of 55 miles per hour.

By the 22nd the disturbance had practically passed off the seaboard to the Tasman Sea, and although further light to moderate rainfall, with fresh to strong westerly winds, still persisted over Victoria and Tasmania, yet in New South Wales fine weather obtained generally.

At 9 a.m. on the following day, the eastern half of the continent was under anticyclonic control, but the high pressure was perceptibly weakening daily, having lost three-tenths of an inch in central barometric value since the 19th, thus giving inducement to the rather rapid advancement of another depression, which, between 9 a.m. on the 22nd and 23rd, had travelled 900 miles eastward.

The pressure distribution on the 24th and 25th was rather unusual, for the depression by 9 a.m. on the former day had assumed abnormal proportions and covered the area south of lines joining Perth, Alice Springs, and Melbourne, whilst over portions of Northern Australia, monsoonal activity was in evidence between the Gulf of Carpentaria, Boulia, and Alice Springs.

Strong dusty northerly winds, with fierce squalls, occurred over South Australia and on the shores of the Great Bight, and rising temperatures together with falling barometers, were reported from all the States but West Australia. In the latter State showery weather, with south-west gales and rough to high seas obtained on the South Coast.

The highest and lowest temperatures recorded over the various subdivisions of the State between the 19th and 25th were as follow :—

Western Division	Bourke ...	87 degrees.	Mt. Hope	32 degrees.
North-western Slopes ...	Mogil ...	82 ,,	Collarendabri	31 ,,
Central-western Plains ...	Carinda ...	86 ,,	Carinda.	28 ,,
Riverina	Hay	82 ,,	Narrandera	31 ,,
North-western Slopes ...	Narrabri ...	78 ,,	Warialda	29 ,,
Central-western Slopes ...	Wellington ...	77 ,,	Coolah	23 ,,
South-western Slopes ...	Morangarell ...	74 ,,	Young	30 ,,
Northern Tableland ..	Tabulum ...	74 ,,	Inverell & Glen Innes each	26 ,,
Central Tableland	Cowra ...	75 ,,	Mudgee	27 ,,
Southern Tableland ...	Goulburn ...	67 ,,	Nimitybelle	22 ,,
North Coast	Kempsey ...	86 ,,	Kempsey	36 ,,
Hunter and Manning ...	Camden Haven	82 ,,	Jerry's Plains	33 ,,
Metropolitan	Parramatta ...	78 ,,	Parramatta	36 ,,
South Coast...	Picton ...	77 ,,	Bodalla	33 ,,

Between the 26th and 30th, two high and two low pressure systems travelled across the continent. The first "high," represented by only one isobar, was shown on the 26th over New South Wales and the South Island of New Zealand, and was associated with fine, clear, and quiescent weather conditions. The "low" which appeared on that day, was situated over the southern districts of the continent, from Esperance to the Great Bight, and controlled fresh to strong northerly winds for the most part, but strong south-westerlies on the south-western seaboard, and a strong westerly gale at Eddystone in Tasmania. Moderate to rough seas also occurred between the Leeuwin and Wilson's Promontory. By the 28th, the incipient high pressure had passed off the main land, but the rear isobars of the depression were shown running along the coastal districts from Clarence Heads to Hobart; and showery weather obtained south from Jervis Bay. In proximity to the "low" was the advance portion of the second anticyclone, on the north-east side of which had appeared a rather pronounced depression. During the night of the 28th, or early on the morning of the 29th, as the result of this distribution, some severe squalls and rain, with scattered thunderstorms, were experienced along the coastal and north-eastern districts of New South Wales, as also in south-eastern parts of Queensland. The path of the centre of the high pressure which had attained the barometric value of 30·47 inches, was well to the south of the continent. This circumstance assisted in the development of severe wind and sea conditions on our seaboard.

The distribution of rainfall over the various subdivisions of the State during September, 1908, was as follows:—

		Departure from normal. Average Points. Below.		Above.
Western Division	from	133	to	131
North-western Plain	,,	142	,,	37
Central-western Plain	,,	17	,,	84
Riverina	,,	152	,,	69
North-western Slope	,,	148	,,	21
Central-western Slope	,,	136	,,	47
South-western Slope	,,	12 to 204		—
Northern Tableland	,,	313	,,	44
Central Tableland	,,	141	,,	266
Southern Tableland	,,	356	,,	147
North Coast	,,	405	,,	306
Hunter and Manning	,,	438	,,	234
Metropolitan	,,	16	,,	237
South Coast	,,	81	,,	205

Remarks.

During the month of September, a considerable deficiency in rainfall was experienced over the greater part of the central and western districts of the State. From Tibooburra, in the far north-west, to Barringun, conditions were very dry, no rainfall whatever having been recorded.

Amounts in excess of the normal were reported from the southern border districts, the greater part of the south-eastern quadrant, and from the North-western Plain and Slope and Northern Tableland. Out of all the coastal stations, Sydney, and one or two places on the extreme South Coast, alone had totals above average.

Temperature.

Speaking generally, temperatures for the most part were below normal. The highest registration for the month was 93 degrees on the 28th at Bourke, but earlier in the month (between the 14th and 17th) all the inland subdivisions had stations which experienced minimum temperatures either at or below freezing point.

Comparison with India.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia as far as data are available, for the month of September, 1908:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	inches.	degrees.	
Simla (India) ...	0·00	+0·1	Normal.
Sydney (N.S.W.) ...	- 03	-1·1	Above on southern border and greater part of slopes and tablelands; otherwise generally below. Dry on N.W. border.
Melbourne (Victoria)	-·04	-1·1	Rain above average, except central south.
Adelaide (S.A.) ...	+·01	-3·1	Above; very heavy in northern interior; Northern Territory rainless.
Perth (W.A.) ...	-·08	-0·4	Above in extreme S.E., below elsewhere, especially in S.W.

The above table shows that, with pressure and temperature practically normal in India, the rainfall also has equalled the average amount. In Australia, however, temperature and pressure were both below normal, excepting in Adelaide, where the latter element was slightly above. Rainfall in excess of the average was experienced in South Australia and the south-eastern districts of West Australia, as also over the greater part of Victoria and southern borders, slopes, and tableland divisions of New South Wales, but otherwise the monthly totals were in defect, and in parts very dry.

CLIMATOLOGICAL Table for the month of September, 1908, compiled from daily telegraphed returns.

Station.	Mean Barometer at 9 a.m.*	TEMPERATURE.							Rainfall, Inches.
		Mean Maximum.	Mean Minimum.	Absolute Maximum.	Date.	Absolute Minimum.	Date.	No. of days below 40 deg.	
Walgett	30·16	71·3	44·6	89°	28	30°	16	9	0·61
Bourke	30·12	76·6	41·1	93	28	31	17	9	0·18
Wilcannia	30·08	67·9	41·9	83	11	32	16	7	0·43
Wentworth	..	66·0	43·2	80	25	24	17	4	2·38
Hay	30·05	69·0	38·7	83	12	29	14, 15, 16	15	1·19
Deniliquin	30·03	63·4	42·0	77	12 & 25	31	16	12	1·09
Albury	30·06	61·1	40·7	73	12	30	15	11	3·34
Forbes	30·11	62·8	42·0	75	26	32	16	11	1·78
Dubbo	30·07	66·9	40·7	81	26	31	16	14	1·47
Clarence Heads	30·14	68·0	53·1	76	14	45	16, 17, 30	0	1·65
Port Macquarie	30·08	68·3	48·0	75	3	40	15	0	2·04
Newcastle	30·06	64·7	51·0	80	26 & 28	42	21	0	1·91
Sydney	30·028	65·6	49·9	81·9	25	42·1	15	0	3·028
Jervis Bay	30·04	58·8	48·4	68	10 & 21	41	15	0	3·12
Eden	..	...	...	...	..	...	...	...	...

* Corrected to 32 deg. F. and M.S.L.

Orchard Notes.

W. J. ALLEN.

November.

Cultivation.—It is most important that the cultivation of the soil should receive special attention at this season of the year, as by keeping the ground well worked to a depth of several inches it prevents evaporation. After each rain or irrigation the whole of the orchards and vineyards should receive a thorough cultivation immediately the ground is dry enough. Do not wait until a hard crust forms on the top of the soil, but put on all available help and have the surface broken up immediately. Keep the trees and vines well worked around with a fork hoe or pronged fork. The plough should never be brought into requisition at this time of the year, except, perhaps, in a very wet, cool district; but the soil should be kept stirred to a depth of four or five inches with a good cultivator.

Summer Pruning may be started this month, and it is well to go over and regulate the growth of all young trees, thinning and shortening back where required, that is, where the tree is growing too thick, and pruning or pinching back so as to keep the tree evenly balanced and symmetrical. This early summer pruning is more for young trees, to aid in directing the growth to that part of the tree where it is most required.

Pruning of citrus trees may be continued wherever not completed.

Pruning and manuring of passion-fruit vines may be carried out during the early part of this month.

Whenever Thorny Mandarins show signs of cropping too heavily, it will be well to prune them a little more severely, as well as removing some of the fruit from the tree, so that the latter will not overbear and exhaust itself this season. If allowed to overbear the fruit will be small and almost worthless.

Budding of citrus trees may still be carried on.

Irrigation.—Where irrigation is practised, a thorough watering should be given to all trees towards the end of the month. This should be the second watering of the season. Be most careful to keep the water confined to the furrows, as wherever the land is flooded it is likely to become hard. As soon as the furrows are dry enough to work, cultivate the orchard twice, and loosen the soil around any young trees with a fork hoe.

Spraying.—All citrus trees attacked by the Maori or other fungous diseases should be sprayed with Bordeaux mixture. In applying a spray like Bordeaux mixture to citrus trees it will be found advantageous to apply it in a small quantity at a time, in two successive sprayings, rather than one heavy application, which may run off the surface of the young fruit.

Never fumigate trees for several months after they have been sprayed with Bordeaux mixture, as, if they are so treated, all the leaves will fall off, many of the smaller twigs, and occasionally the top part of the tree, will be killed.

If it is desired to spray citrus trees with Bordeaux mixture for any of the different fungous diseases which attack them occasionally, it would be well, wherever the trees require fumigation, to treat the trees for the scale pests first (if fumigation is to be practised), after which they may be sprayed as many times as is necessary, without fear of damaging them—that is provided they are in a good healthy condition.

Fruit-fly.—In districts where the fruit-fly has been troublesome in previous seasons, particular care should be taken to pick up and destroy all fallen and fly-infested fruits, and boil them, in order to ensure the destruction of all larvæ which may be contained therein. Set kerosene traps as soon as the fly appears. At present these are the only sure ways known of helping to keep down this pest, and I would urge upon growers the importance of doing their best in this respect.

Codling Moth.—Every care should be taken to destroy the codling moth, which makes its appearance about the time the apple-trees finish blooming, lays its eggs on the young fruit and leaves, and after hatching works its way into the apple, and within a few weeks emerges and lowers itself down to the ground by a silken thread, and immediately seeks shelter by crawling up the tree and getting into any crack or underneath any old loose bark, either on the tree, or props, or any loose rubbish which will provide a hiding place. The orchard should, therefore, be kept free of such rubbish, and all trees bandaged at a height of about 10 inches from the ground. The grubs will harbour in the bandages, which should therefore be removed every ten days and all grubs killed. Pick up and destroy all fallen fruit. Continue spraying with arsenate of lead or arsenite of soda.

Inspectors have now been appointed in different parts of the country, with instructions to see that all growers are using every reasonable precaution to keep the codling moth and fruit-fly in check; but we hope that by this time every grower is convinced that it is to his own interest to co-operate with his neighbours in using every means to stamp out these pests, and I feel sure that if they will work with a will the fruit industry will soon be in a much better position than it has been in the past.

Disbudding.—See that all superfluous growth is removed from the roots and trunks of all trees and vines, so that the new growth will be confined to the development of limbs and canes which have been selected to form the main arms and branches of such tree or vine. It is regrettable to see suckers growing from the roots of many trees and vines which could, with a very little trouble, have been removed, when such misguided energy would have gone towards the development of the tops of such plants.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1908.

Society.	Secretary	Date.
Lismore A. and I. Society	T. M. Hewitt	Nov. 11, 12, 13
Berry Agricultural Association	A. J. Colley	„ 24, 25, 26, 27

1909.

Society.	Secretary	Date.
Dapto A. and H. Society	G. A. McPhail	Jan. 13, 14
Kiama A. Association	R. R. Somerville	„ 26, 27
Alstonville A. Society	W. W. Monaghan	Feb. 3, 4
Wollongong A., H., and I. Association	F. W. Philpotts	„ 4, 5, 6
Moruya A. and P. Society	John Jeffery	„ 10, 11
Shoalhaven A. and H. Association, Nowra	Henry Rauch	„ 10, 11
Guyra P., A., and H. Association	...	„ 16, 17
Kangaroo Valley	E. G. Williams	„ 18, 19
Manning River A. and H. Association, Taree	S. Whitehead	„ 24, 25
Gunning P., A., and I. Society	W. T. Plumb	„ 25, 26
Nambucca A. and H. Association, Macksville	M. Wallace	„ 25, 26
Tenterfield P., A., and M.	F. W. Hoskins	Mar. 2 to 6
Bega A., P., and H. Society	W. A. Zuegel	„ 3, 4
Bellinger River A. Association	S. S. Hindmarsh	„ 3, 4, 5
Nepean District A., H., and I. Society, Penrith	Percy J. Smith	„ 4, 5
Berrima District A., H., and I. Society, Moss Vale	I. Cullen	„ 4, 5, 6
Molong P. and A. Association	Charles E. Archer	„ 10
Campbelltown Agricultural Association	Fred Sheather	„ 10, 11
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	„ 10, 11
Bowraville A. Association	C. Moseley	„ 11, 12
Crookwell A., P., and H. Society	M. P. Levy	„ 11, 12
Gloucester Show	Edward Rye	„ 11, 12, 13
Newcastle A., H., and I. Society	C. W. Donnelly	„ 11, 12, 13
Gulgong A. and P. Association	S. J. Cox	„ 16, 17
Inverell P. and A. Association	J. McIlveen	„ 16, 17, 18
Camden A., H., and I. Society	C. A. Thompson	„ 17, 18, 19
Cobargo A., P., and H. Society	T. Kennelly	„ 18, 19
Blayney A. and P. Association	E. J. Dann	„ 23, 24
Hunter River A. and H. Association	C. J. H. King	„ 23, 24, 25
Yass P. and A. Association	Will Thomson	„ 24, 25
Macleay A., H., and I. Association	E. Weeks	„ 24, 25, 26
Warialda P. and A. Association	W. B. Geddes	„ 24, 25, 26
Mudgee A. Society	H. Lamerton	„ 24, 25, 26
Clarence P. and A. Society, Grafton	T. T. Bawden	„ 24, 25, 26
Gundagai P. and A. Society	A. Elworthy	„ 30, 31
Murrumburrah P., A., and I. Association	J. A. Foley	„ 30, 31
Cooma P. and A. Association	C. J. Walmsley	„ 31, Apl. 1, 2
Upper Hunter P. and A. Assoc., Muswellbrook	J. M. Campbell	„ 31, Apl. 1, 2
Bathurst A., H., and P. Association	G. W. Thompson	Mar. 31 Apl. 1, 2
Royal Agricultural Society, Sydney	H. M. Somer	Apl. 6 to 14
Orange A. and P. Association	W. Tanner	„ 21, 22, 23
Durham A. and H. Association, Dungog	C. E. Grant	May 5, 6
Central Australian P. and A. Association, Bourke	G. W. Tull	„ 19, 20
Forbes P., A., and H. Association	N. A. Read	Aug. 18, 19
Murrumbidgee P. and A. Association, Wagga Wagga	A. F. D. White	„ 24, 25, 26
Grenfell P., A., and H. Association	Geo. Cousins	„ 31, Sept. 1

[1 Plate.]

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Agricultural Gazette of New South Wales.

Forestry.

SOME PRACTICAL NOTES ON FORESTRY SUITABLE FOR NEW SOUTH WALES.

[Continued from page 796.]

J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

XIX—*continued.*

Trees other than Conifers and Palms:

The Figs (*Ficus*).

Moraceæ.

WE now come to the genus *Ficus* or Fig, so called from the best known species of the genus *Ficus Carica*, the edible Fig.

The Port Jackson Fig (*Ficus rubiginosa*), is illustrated and described in Parts i and xx of my "Forest Flora of New South Wales," in which work will appear all the New South Wales ones in due course.

Many of the Figs have fruits which are eaten by birds and animals, and a few by human beings. Some of them contain caoutchouc (india-rubber) in their sap. Speaking generally, this substance is a tropical product, and the most likely portion of New South Wales for success with rubber-producing species is the north-eastern corner (Clarence to Tweed), but experimental work in this direction in New South Wales is only in its infancy at present.

Figs are very useful trees for the warmer parts of this State, as a number of them flourish in the poorest soil, and are so tenacious of life that they may be hacked into shape with impunity. They, indeed, as a class, stand bad treatment to an extent which is fatal to the majority of trees. Many of them are hemi-epiphytes, that is to say, they spend at least a portion of their existence on or embracing other plants, not, however, penetrating their tissues as parasites do.

Figs are propagated readily enough from seed when one can get it good. For example, it is easy enough to propagate *F. macrophylla* in that way; *F. rubiginosa* (Port Jackson Fig) is rather uncertain, and *F. Cunninghamii* is very uncertain. *F. Bennettii* produces fruit every year in Sydney, but not a single seed in it has been seen so far.

Figs in general are propagated from layers and cuttings, but to make a success of the work requires the technical skill and appliances of the nurseryman.

I am specially indebted to Mr. George Harwood, Superintendent, Botanic Gardens, Sydney, for valuable information in regard to some of the Figs

referred to in this paper. Indeed, I am often under special obligations to Mr. Harwood for the results of his long local experience in regard to the cultivation of exotic trees.

1. *F. bengalensis*, L. (syn. *F. indica*, Roxb.) The celebrated "Banyan tree" of India. See tt. 13 and 81*c*. of vol. i, King's *Ann. Bot. Gard.*, Calcutta. Native of Tropical Asia.

Sydney is just a little cold for it, although in the Botanic Gardens we have had a fair specimen for many years. People used to injure its aerial roots, so a few years ago I caused the ground a few yards from the stem to be enclosed with barbed wire. I am hopeful to make the tree form an arch over a pathway. It should do well on the Northern rivers.

1. Ficus bengalensis, L. (F. indica, Roxb.).
Botanic Gardens, Sydney.

It is one of the so-called "Strangling Figs," that is to say, it starts life on another tree, the seed being dropped on it by a bird. It grows, and finally envelops the original plant. Such Figs, of which our Port Jackson Fig is one, are said to be hemi-epiphytal.

An interesting account of the celebrated Banyan tree of the Calcutta Botanic Garden will be found in Hooker's "Himalayan Journals," ii, 246; it originally sprouted on a Date Palm.

Those who desire to pursue the subject of Strangling Figs further, may turn to Dr. William Trelease's paper on the subject in the 16th Annual Report of the Missouri Botanic Garden, p. 161.

For an excellent account of *F. bengalensis*, see Gamble's "Manual of Indian Timbers," 1902 edition, p. 638.

L 17. See photo. of a specimen, Sydney Botanic Gardens.

2. *F. Benjamina*, L. "Weeping Fig"; "Warringin" of the Malays. See tt. 52 and 83*h* of vol. i of King's *Ann. Bot. Gard.*, Calcutta.

One of the most beautiful of all species. Its branchlets have a graceful drooping habit. It is a native of Tropical Asia, including Malaysia (King says it is truly indigenous only in Timor, Sumatra, and Celebes), and is hence just a little tender in Sydney; but on the Northern rivers it should flourish. In a sheltered situation in the Sydney Botanic Gardens it does sufficiently well to show how beautiful an object it would be under tropical conditions.

2. Ficus Benjamina, L.
Botanic Gardens, Sydney.

Our tree has had to be cut back owing to the exigencies of space, and contemplation of many beautiful Figs in this garden which have had to be so treated makes one regret very much that there is in Sydney no area sufficiently large for a proper arboretum, where trees could live their lives with a minimum of interference. Hundreds of acres would be required.

L 23 a. See photo. of a specimen in the Sydney Botanic Gardens.

3. *F. Bennettii*, Seem. "Dr. Bennett's Fig." Following is Seemann's original description of this specially handsome species, whose original habitat is even yet a matter of surmise. The present plate and the description are furnished in the hope that we may be able to trace it.

F. Bennettii (n. sp.) Seem. mss. in Herb. Mus. Brit. ; arborea ; ramulis petiolis pedunculisque pubescentibus ; foliis alternis ovato-oblongis acuminatis basi cordatis, margine integerrimo undulato, glabris penninerviis, venis primariis utrinque 10–12, subtus prope axillas glanduliferis ; receptaculis axillaribus solitariis (an semper ?) pedunculatis globosis pedunculisque velutinis ; pedunculis medio 3-bracteatis ; bracteis ovatis obtusiusculis,—Viti, exact locality not specified (according to specimens cultivated at the Botanic Gardens, Sydney).

I have named this fine species, which is allied to *F. Granatum*, Forst., *F. Moorei*, Seem., *F. habrophylla*, G. Bennett, and *F. Tanensis*, G. Bennett, in honor of my esteemed friend Dr. George Bennett, F.L.S., of Sydney, author of several well-known works on Polynesia. Branchlets stout. Leaves coriaceous, from 8–10 inches long and 4–6 inches broad. Petiole, 1 inch long. Peduncle, 10–12 lines long. Receptacle, 1½ inch in diameter. (*Fl. Vitiensis*, p. 250.)

Mr. W. R. Guilfoyle, Director of the Botanic Gardens, Melbourne, who made extensive travels in the Pacific Islands, informs me that both this

3. Ficus Bennettii, Seem.
Botanic Gardens, Sydney.

species and that named *P. panduriforme* by W. Sharp Macleay, of Sydney, were first obtained by his father, the late Mr. M. Guilfoyle, of Sydney, from Mrs. Geddie (wife of the Rev. Dr. Geddie), of Aneityum, New Hebrides, brought by a schooner to that island (of which it is not a native), and no one knows the original island to this day. The name *Bennettii* was originally applied to this Ficus by Mr. M. Guilfoyle, and adopted by Dr. Seemann.

U 8 ; L 5, 15 b, 23. See photo.

4. *F. brasiliensis*, Linkl. A medium-sized, shapely tree, with rather a spreading habit. It does well with us. We have to cut it back each year to keep it in bounds. One of the numerous large-leaved Figs, with entire margins. It is semi-deciduous, and grows very dense in summer.

L 5.

5. *F. capensis*, Thunb. "Cape Fig."

"A good-sized tree, indigenous in the warm lower forests at Knysna and the Amatolas. In tropical countries various species of Figs are commonly employed for roadside planting. They succeed better than most trees on dry, stony ground, and afford an ample and dense shade. They are propagated by simply planting a stake in the ground, watering, and protecting by a mud wall or otherwise. When once rooted they are able to withstand the most intense drought and heat. In a nursery, Fig trees are raised easily from layers and cuttings; with difficulty from seed" (Hutchins, Capetown), *i.e.*, the difficulty is to get good seed.—(J.H.M.)

6. Ficus Chauvieri, Hort.
Botanic Gardens, Sydney.

This Fig does not appear to be in New South Wales, and I am endeavouring to introduce it

6. *F. Chauvieri*, Hort. I cannot ascertain its botanical origin; it seems to be related to *F. bengalensis*.

It is a handsome, broad-leaved species, which does well in places, even in exposed situations. The two specimens that we have, have had to be cut back owing to the requirements of the Garden, otherwise they would have formed large trees.

L 5, 17. See photo.

7. *F. columnaris*, Moore and Mueller. The "Banyan" of Lord Howe Island.

The aerial roots of this tree ultimately touch the ground and form thick trunks. Some of them each cover 2 acres and more.

Banyans can readily be noted, on the island, even at a considerable distance, amidst the surrounding arboreal vegetation, by the brown appearance of their foliage, which gives them the look of fading or dying trees This species reminds one of *F. macrophylla* a good deal. Cattle eat Banyan leaves, and they are reputed to be good for dairy cows. See also *F. macrophylla.*

Its habit causes it to furnish an excellent shade tree.

L 18. See photo. of specimen in Sydney Botanic Gardens.

7. Ficus columnaris, Moore and Mueller.
Botanic Gardens, Sydney.

8. *F. Cunninghamii*, Miq. "Cunningham's Fig." This is a native of coastal Queensland, not occurring indigenously further south than 28° S.

"Beni" of the aborigines, according to Roth, who says that the natives of the Pennefather and Batavia Rivers make a reddish twine for dilly-bags from the dried inner bark of the roots.

It is a Fig which accommodates itself to the lower temperatures of coastal New South Wales admirably, and, although deciduous in most winters in Sydney, it flourishes admirably as far south, and it is an excellent addition to our ornamental trees. Indeed, in our climate, where the vast preponderance of trees is evergreen, a good deciduous tree is, in my view, a decided acquisition.

L 1, 23, 35, 20 b. See photo. of specimen in Government Domain.

9. *F. cydoniæfolia*, Hort. A small tree, of erect habit, absolutely deciduous with us, and one of very few species so deciduous in the Sydney climate. Its

leaves remind one of those of the Quince, hence the specific name, which, however, I cannot trace. The origin of many Figs now under cultivation is exceedingly perplexing, and, as opportunities offer, I may draw attention to them from time to time.

M 25.

10. *F. elastica*, Roxb. "India-Rubber Tree." Native of Tropical Asia. The sap yields some of the India-Rubber of commerce. See t. 54 of *Ann. Bot. Gard*, Calcutta.

In my view this is the india-rubber producing tree most likely to be commercially successful in eastern New South Wales. From the photograph of

8. Ficus Cunninghamii, Miq
Government Domain, Sydney

the Botanic Gardens' tree it will be seen that it will grow in Sydney, but it does not grow rampantly as an India-rubber tree should, and therefore it is only recommended for our warmer Northern rivers.

In its native countries it is a gigantic tree, and is usually epiphytic. When we read of the very great size and abundance of this tree in the Indian Empire, and realise the fact that there is an enormous amount of native labour available, skilled in rubber getting, we see that the competition of New South Wales in the world's markets (and even Australian) for rubber is exceedingly difficult.

For an account of the cultivation of this tree and the extraction of rubber from it, with practical details, see Gamble, *op. cit.*, p. 641.

L 21 c, 35. See photo. of specimen in Garden Palace Grounds.

11. *F. gibbosa*, Blume, Native of the East Indies. *F. cuneata*, Miq., from the Philippines is a synonym. See t. 2, and vol. i of *Ann. Bot. Gard.*, Calcutta.

This is one of the trees which, in its native home, is epiphytic.

Gamble ("Manual of Indian Timbers," 1902 edition, p. 637) has the following interesting note concerning it.

It is curious that King should write of this species as a "tree" and his statement is followed by the Fl. Br. Ind. Bedomme also calls it a tree, Brandis a large tree or epiphyte,

10. Ficus elastica, Roxb.
Garden Palace Grounds, Sydney.

and the "Ceylon Flora" "an epiphyte in a young state, finally a tree." I have myself seen it growing in various parts of India, but never that I can remember as anything but a large epiphytic shrub, preferring to grow on other figs such as the pipal and banyan, or on walls or well-sides, and giving out a multitude of interlacing aerial roots. Talbot seems to share my experience. It is, however, strange that Roxburgh who lived long in the Circars, where it is common, writes of it as a tree, and mentions a beautiful specimen at Ganjam. Its broad rhomboid scabrous leaves are characteristic. The leaves are used to polish ivory (Roxb.), and are given to cattle, being supposed to increase the flow of milk.

This is a very variable species, and Sir George King recognises the typical form and three varieties. Our plant seems not to be different from the typical form; its leaves are not scabrous like those of Mr. Gamble's tree.

In the Garden Palace Grounds our plant is a sturdy tree of medium height, and nearly deciduous in winter in the very exposed situation in which it is. It is symmetrical, and very umbrageous in the summer. Certainly a valuable tree for park conditions. Leaves quite smooth and shining, almost ovate (no apex), and on the average, say, 4 inches long by 2½ inches wide. Texture thin.

U 2 k and 4 c; L 35 c. See photo. of a specimen in the Sydney Botanic Gardens.

11. Ficus gibbosa, Blume.
Botanic Gardens, Sydney.

12. *F. glabella*, Blume. This is a tree which, in the Sydney and Melbourne Botanic Gardens, has passed under more than one *alias*. It was labelled *F. lucida* and also *F. rubiginosa*, var. *lucida*. Sir George King determined our plant to be *F. glabella*.

F. glabella, Blume, is synonymous with *F. nesophila*, Miq., or, more correctly, it should be referred to as *F. nesophila*, F.v.M. (ex *Miq. Ann. Mus. Lugd. Bat.*).

It is a noble evergreen Fig-tree, which is thoroughly at home in Sydney. It is umbrageous, hardy, handsome, and remarkably free from disease.

L 26. Photo. of specimen in Sydney Botanic Gardens.

13 *F. glomerata*, Roxb. (syn. *F. vesca*, F.v.M.). "Clustered Fig." See t. 218, vol. i, *Ann. Bot. Gard.*, Calcutta. "Clustered Fig," or "Leichhardt's Clustered Fig"; "Parpa" of the aborigines according to Thozet. The fruit is called "Mu-char" by the aborigines at Cooktown (Dr. Roth).

This is a large deciduous tree, native of the East Indies, and also of Queensland and Northern Australia.

12. Ficus glabella, Blume.
Botanic Gardens, Sydney.

In the Sydney district it is a small tree, and remarkable to us because of the position of the fruits, which are directly produced on the stem. They are often seen just above the ground. This phenomenon of the occurrence of flowers (and therefore fruits) on the trunks of trees (in some kinds of trees they may be on the branches also), is technically called "cauliflory."

Gamble, speaking of India, says: "The large fruits appear on the trunk and branches, are produced in profusion, red when ripe and edible, but usually too full of insects."

As regards Australian trees, I wrote some years ago that the fruit, which is of a light red colour when ripe, hangs in clusters along the trunk and on some of the highest branches, and is used as food by the aborigines. Mr. C. Hedley (*Proc. R.S. Qd.*, v) mentions that the Port Curtis blacks feed on them, and at the same time states that the settlers make excellent jelly of them. Palmer makes a similar observation. Perhaps this Fig is referred to in the following passage, written about 1770:—"To the northward we had a kind of very indifferent fig (*Ficus caudiciflora*), growing from the stalk of a tree."—(*Journal of the Right Hon. Sir Joseph Banks*, p. 299.) This was confirmed in the *Journal of Botany*, 1901, p. 4.

The ripe fruit is eaten, and is good either raw or stewed (Gamble). Brandis, however, says: "In times of scarcity the unripe fruit is pounded, mixed with flour, and made into cakes."

This tree possesses an astringent bark; this, as well as the fruit, which is considered to have similar properties, is prescribed in hæmaturia, menorrhagia, and hæmoptysis. The dose is about 200 grains. The fruit, filled with sugar, is considered to be very cooling, and the small, blister-like galls which are common on the leaves, soaked in milk and mixed with honey, are given to prevent pitting in smallpox. Ainslie tells us that "from the root of the tree, which in Tamil is called Attievayr, there exudes, on its being cut, a fluid which is caught in earthen pots, and which the Vytians consider a powerful tonic when drunk for several days together." In Bombay the sap is a popular remedy, which is locally applied to mumps and other inflammatory glandular enlargements, and is used in gonorrhœa. (Dymock, *Materia Medica of Western India*.)

The leaves are used in India for cattle and elephant fodder (Gamble).

Bird-lime is made in India of the milky juice of this tree.

The timber, like that of Figs in general, is of little value; but the tree, from the way in which the fruit grows, is one of the most interesting of trees to many people, and is therefore worthy of a place in the garden of a lover of trees.

L 29 b.

14. *F. habrophylla*, G. Bennett. Native of the New Hebrides.

See Bennett's "Gatherings of a Naturalist," p. 341. *Nomen nudumthen*, but description furnished by Seemann. *Fl. Vitiensis*, p. 248.

F. habrophylla, G. Bennett, *op. cit.*; arborea; ramulis, petiolis receptaculisque velutino-pubescentibus; foliis alternis obovato—oblongis integerrimis attenuatis basi cordatis penninerviis, venis primariis utrinque 15–17, glabris; receptaculis axillaribus geminis pedunculatis obovato-obtusis pedunculo medio articulato 3-bracteato, bracteis ovatis acutis.—Tana, New Hebrides. Cultivated in the Botanic Gardens, Sydney, New South Wales. Branchlets stout. Largest leaves from 12–15 inches long and from 6–8 inches broad. Receptacles as large as those of the ordinary garden Fig.

This is the tree probably referred to by Mr. Guilfoyle (see *F. Bennettii*) as having been named *F. panduriforme* by the late W. Sharp Macleay, and distributed under that name.

It is of the *F. Bennettii* character, but less umbrageous. The leaves are exceedingly large in a young state, and are softer than those of *F. Tanensis*, and less bullate than in that species. The bases of the leaves are more or less cordate and the margins of the leaves are more or less toothed, which is accentuated towards the base. The size of the leaves is now about 1 foot to 15 inches, and 5 inches wide. Formerly they were 2 feet long.

M 17. (Amongst the Palms.)

15. *F. Harlandi*, Benth., China. See p. 113 and t. 148 of vol. i, *Ann. Bot. Gard.*, Calcutta. Sir George King suspects that it may be only a form of *F. fistulosa*, Reinw.

This has proved an admirable tree for the Sydney district, standing the sea-air well. It is hardy, shapely, and umbrageous. It is one of the few species that loses all its leaves for a short time. They are broadly-lanceolate, entire, smooth, and of the same colour on both surfaces, say 5 inches long and half as wide, but rather variable as to size ; small-fruited. The tree can be readily trimmed to one trunk, but naturally forms a dense growing umbrageous tree, with branches close to the ground.

L 1, 17, 18, 22, 23. See photo.

15. Ficus Harlandi, Benth.
Botanic Gardens, Sydney.

16. *F. laurifolia*, Lam. Tropical America. The tree in the Garden Palace Grounds is the largest specimen we have. It is about 30 feet high. It does not form a single trunk, but a large agglomeration of several large branches.

It is well named laurel-leaved, and it has unusually long leaf-stalks. It will certainly flourish in Sydney.

It is just inside the Garden Palace grounds, to the left from the Marble Fountain in the Middle Garden. A second specimen is in the same border, 100 feet away.

See photo.

17. *F. macrophylla*, Desf. "The Moreton Bay Fig." This tree is thoroughly well-known to people in the Sydney district.

16. Ficus laurifolia, Lam.
Garden Palace Grounds.

To hear some people talk, all Moreton Bay Figs should be banished from the Sydney district, but it does not seem to be realised that it is one of the best trees ever introduced to Sydney. It will grow amongst rocks where scarcely anything else will grow, and it will stand being blown upon by fierce winds and being hacked about and otherwise ill-used. I admit that it can be put in the wrong place; but a Moreton Bay Fig with plenty of room, so that it can live its life, is one of the most beautiful of trees, while its foliage and fruit are nutritious to stock, and its umbrageous head affords a grateful shade.

I have drawn attention (*Agric. Gazette*, 1893, p. 609; 1894, p. 206) to the value of this tree to dairy farmers. The observations were original as regards Australia, though I afterwards found that leaves of other species of *Ficus* are used for feed in parts of India.

Bearing in mind the way in which these and other native Figs flourish exceedingly in the poorest soil, that cattle devour the leaves and branchlets greedily, that they will submit to persistent hacking back to an extent which will kill most other trees, it seems a matter for consideration that these trees should always be planted for shade purposes on dairy farms and they should even be planted as a reserve of fodder in stony, sterile places where no grass will grow.

L 15 c, 18, 34. See photo.

17. Ficus macrophylla, Desf.
Botanic Gardens, Sydney.

18. *F. Moorei*, Seemann. This species seems to have disappeared from the Sydney Botanic Gardens, and I republish the original description in order that it may be recovered, as it is probably in Sydney.

F. Moorei (n. sp.), Seem. mss. in Herb. Mus. Brit.; arborea; ramulis pilosulis demum glabris; foliis alternis petiolatis ovato-oblongis acuminatis basi subcordatis, margine integerrimo undulato, glabris penninerviis, nervis primariis 7–13 (costaque in stirp. junior. purpureis); receptaculis axillaribus geminis pedunculatis obovatis glabris, pedunculo medio incrassato 3-bracteato, bracteis ovatis obtusiusculis.—*F. sanguinervium*, Hort. *F. Cooperi*, Hort. ex Regel, Index Semin. Hort. Petropolit, 1866,

p.89 (?).—Samoan Islands (according to the records of the Sydney Botanic Gardens). Branchlets stout. Petiole 1½–2 inches long. Blade of leaf from 10–12 inches long, and from 4½–5 inches broad. Peduncle about ⅛ as long as the petiole. Receptacle 6 lines in diameter. I have named this species in honor of my esteemed friend, Mr. Charles Moore, Director of the Botanic Gardens, Sydney. Dr. Bennett writes,—"The plant is sold here at Sydney under the name of *F. sanguinervium*, from the midrib and primary veins being of a purplish colour, but as this peculiarity is only seen in very young specimens, and disappears as the plant grows older, it would be an objectionable specific name." I am almost sure that *F. Cooperi* of our gardens, lately described by my friend Dr. Regel in the Seed Catalogue of the Petersburg Garden, must also be referred here as a synonym. Dr. Regel was good enough to send me a leaf, which agrees tolerably well with those of the specimens from the Sydney Gardens. (Seemann, *Flora Vitiensis*, p. 249.)

19. *F. natalense*, Hochst. "Natal Fig."

According to Mr. Hutchins, late Chief Conservator of Forests, Cape Colony, this is a handsome tree, affording a dense shade, that has been successfully planted in the streets of Capetown. It resists the south-easters well.

30. Ficus nymphæfolia, Mill.
Botanic Gardens, Sydney.

So far as I know, this tree has not been introduced into Australia, though steps are being taken to rectify the omission.

20. *F. nymphæfolia*, Mill. Tropical America.

A broad, large-leaved, shade-giving, large, prominently veined species. It is a handsome plant, and distinct species. It would be a very large tree even in the Sydney district, were it not that exigencies of space require it to be cut every year.

M 8. See photo.

21. *F. panduriforme*, Macleay. (See *F. Bennettii*, above.)

I am anxious to recover this Fig for the national collection; it is probably somewhere in Sydney.

The following species have somewhat similar names:—

Panduræfolia, Hort. Par. ex Miq. in *Hook. Lond. Journ. Bot.*, vi (1847), 546=*hirsuta (*Brazil*)*.

Panduræformis, *Miq. Ann. Mus. Bot. Lugd.* Bat. iii, 299=*heterophylla* (Tropical Asia), but we do not appear to have either at present. See also *Ficus sp.* (below).

22. *F. Parcelli*, Veitch, *Veitch's Cat. of Pl.*, 1874, p. 17; figs. pp. 8 and 9 It is figured in *Flores des Serres*, xx, 13 (1877).

A handsome stove plant received through Messrs. Baptist and Sons, of Sydney, whose collector, Mr. Parcell, discovered it in the South Sea Islands. The leaves are handsome, as large as those of *Ficus elastica* but thinner in texture, and profusely blotched with irregular patches of cream-white (our plant shows patches of purple, in addition.—J.H.M.) on a green ground; it is still in use as a stove decorative plant.—(*Hortus Veitchii*, 1906, p. 260.)

The above is written for English readers. In Sydney it forms a small tree, though tender. The coloured variegation of the leaves and fruits is very pretty. It is a very desirable ornamental tree for the Northern rivers.

The reference to *F. elastica* may be perfectly true as regards plants under glass, but not of plants growing in the open air in Sydney. It is a totally distinct class to *F. elastica*, with which it should not be compared. *F. Parcelli* is soft leaved.

We have a tree from the Admiralty Islands, either a distinct form or probably conspecific with *F. Parcelli.* The foliage is greener and it has rather larger leaves than those of *F. Parcelli.* Our tree is younger than our specimen of *F. Parcelli*, but the leaves are much larger at present (perhaps because of its youth, as the leaves of Figs are very commonly larger in the case of young trees), though leaves of *F. Parcelli* have, exceptionally, been seen as large.

L 5.

23. *F. parietalis*, Bl. (Syn. *F. acuminata*, Bot. Mag. t. 3282, non Roxb.) See also Plate 8 of King's Monograph, vol. i, *Ann. Bot. Gard.*, Calcutta. Native of the Malayan Peninsula and Archipelago.

With us a small, bushy tree, with small, nearly ovate leaves, drawn out to a long point. Leaves dark green above, pale green below; veins very prominent underneath; the leaves underneath are rough. The fruit is bright yellow.

L 6 a.

24. *F. religiosa*, L. "Peepul" or "Pipal." The "Sacred Fig Tree" of India and Ceylon. See tt. 67*a* and 84*u* of vol. i, *Ann. Bot. Gard.*, Calcutta.

The sacred "Bo" tree at Anuradhapura, in Ceylon, which was brought from North India and planted in 288 B.C., is probably the oldest, or nearly the oldest tree in the world, historically known. (Emerson-Tennant, "Ceylon," ii, 613, quoted by Gamble.) The sacred tree at Budh Gya, under which Gautama Buddha sat, is only now represented by a successor.

24. Ficus religiosa, L.
Botanic Gardens, Sydney.

Gamble describes this Fig as usually epiphytic, but without aerial roots. It is one of the best known of Indian trees, it is commonly planted in villages, and held sacred both by Hindus and Buddhists. By Hindus the cutting of a Pipal tree is looked upon as a great sin, so that it is rarely felled, and though it is very destructive to forest trees it is difficult to get it cut.

It is, however, largely lopped for cattle, elephant, and camel fodder, but chiefly by Muhammedan attendants.

Gamble states that it (like *F. bengalensis*) is sometimes found enveloping the Date Palm, as in the Saharanpur Botanic Garden.

The Pipal does remarkably well in the Sydney district. It is a deciduous tree, readily recognised by its long, acuminate, graceful leaves. It is well worthy of cultivation in Eastern Australia.

U 4 c; M 3; L 4, 15 c, 19, 25, 29. See photo. of (tree not in full foliage).

25. Ficus rhododendrifolia, Miq.
Botanic Gardens, Sydney.

25. *F. rhododendrifolia*, Miq.

Native of the base of the Sikkim and Bhutan Himalaya and Khasi and Pegu Hills, India. See tt. 58 and 83*m* (for details) of vol. i, *Ann. Bot. Gard.*, Calcutta.

One of the most beautiful of all Figs for the Sydney district. Pendulous in habit, and very dense foliaged. With us a small tree; but in warmer places with better soil, there is no doubt it will become a large tree. Leaves

entire lanceolate-acuminate, shiny above, dull underneath, 6 inches long, with under 2 inches broad is a common size.

L 18 c, 22 f. See photo.

26. *F. Roxburghii*, Wall. Himalaya and Burma. See t. 211 (also frontispiece), vol. i, *Ann. Bot. Gard.*, Calcutta.

A moderate-sized tree in India, A fine species, with large heart-shaped leaves, and conspicuous masses of large figs growing on the trunk. The fruit is eaten, and is fairly good. The leaves are used for fodder. (Gamble.)

With us it is only a shrub; it has grown 6 or 8 feet high in Sydney, but like many of the tropical Figs its wood decays and the plant eventually perishes.

In India it is one of the Asiatic species with largest leaves, and its large fruit is abundantly borne on the stem; the naming of our plant may be quite correct, for it is grown in unnatural conditions. The leaves of our plant are very dark coloured (reddish cast) when young, and distinct in that respect from any other Fig growing with us.

M 30; L 32 b.

27. *F. Schlechteri*, Warburg in *Tropenpflanzer*, vol. vii (1903), p. 582; figured on p. 583. A complete botanical description is given on page 582 in Latin and in German. For some years previously caoutchouc was imported to Sydney from New Caledonia and this caoutchouc was believed to come from a Banyan *Ficus*, supposed to be *Ficus prolixa*, Forst. From the material collected by Schlechter this is found to be an error; the source of the caoutchouc is the tree described as *F. Schlechteri*. The tree is closely allied to *Ficus retusa*, L. var. *nitida*, the common Banyan tree, and has entirely its habit, but while the caoutchouc of the Banyan tree is worthless, the caoutchouc of *F. Schlechteri* is of excellent quality.

The tree is found throughout the whole island of New Caledonia, on all kinds of soils, but always in single specimens. It is also a native of eastern South Asia. The price of its caoutchouc was, in November, 1900, 3s. 5d. per lb., and in Hamburg 3·65 marks per ½ kilo.

Our larger tree in the Sydney Botanic Gardens is only 4 feet high at present, but it promises to do well in the Sydney district. Sydney people will most likely compare it with *F. rubiginosa* as regards its foliage, but both sides of the leaf are glabrous.

28. *F. Tanensis*, G. Bennett. New Hebrides. See Bennett's "Gatherings of a Naturalist," p. 341, *Nomen nudumthen*; but description furnished by Seemann's, *Flora Vitiensis*, p. 248.

F. Tanensis, G. Bennett, *op. cit.*; arborea; ramulis petiolisque glabris; foliis alternis petiolatis ovato-oblongis v. obovato-oblongis abrupto-acuminatis basi cordatis integerrimis glabris penninerviis, venis primariis utrinque 8–10; receptaculis axillaribus geminis longiuscule pedunculatis globosis basi in pedunculum attenuatis puberulis demum glabratis, pedunculis puberulis basi 3-bracteatis, bracteis ovatis acutis.—Tana, New Hebrides. Cultivated in the Botanic Gardens, Sydney, New South Wales. Branchlets stout. Leaves from 6–8 inches long, and from 3–4 inches broad. Peduncles as long as the petioles. Receptacle as large as a cherry.

With us a small tree, with large, broad, strongly-veined leaves. Sydney is undoubtedly too cool for its full development. It is allied to *F. Bennettii*, which grows very much more vigorously with us.

M 12.

29. *F. Vogelii*, Miq. Tropical Africa.

A small vigorous tree, with large entire smooth leaves, many of which are a foot long and 6 inches wide. Petiole long. The midrib and main lateral veins conspicuous.

30. Ficus sp.
Botanic Gardens, Sydney.

There is no doubt that, given good soil and plenty of shelter, this would become a large tree in the Sydney district.

L 33 c (at the back of a large tree of *Grevillea robusta*).

Following are some interesting trees in the Sydney Botanic Gardens, the specific names of which are uncertain at present.

30. *Ficus sp.* A noble tree with aerial roots. Leaves nearly ovate, blunt pointed, the average dimensions about 3 inches long by 2 wide, dark coloured, and very shiny above, paler below, veins not specially prominent except the midrib. Both surfaces quite smooth.

We have no sturdier tree in the garden. It is exposed to the sea air and north-easters, and is obviously a grand species for this situation.

L 22 (near F). See photo.

31. *Ficus sp.* A small tree, yet the stem is a foot in diameter as it has been cut back many times owing to the exigencies of space.

It is a native of the South Sea Islands, but like so many plants from that region in this garden, we have no more definite locality for it. The leaves are lanceolate, with a blunt point, about 4 inches long and 2 wide, thinnish, both sides smooth, paler underneath, margin entire. Bears a profusion of small fruits, spotted in a young state

L 8 (near the statue of "Summer").

32. *Ficus sp.* We have a tree 10 feet high, and slender. Its leaves are now 15 inches long, with a maximum width of 3 inches. Formerly they were at least 20 inches long, broader, and more panduriform (fiddle shaped) than they are now.

The tree forms one of the interesting species of the garden. I cannot trace its origin at present. It has been variously labelled *F. panduriforme* and *F. heterophylla*, L. f. (which it is not). Compare note on *F. panduriforme*, Macleay, above, p. 972.

M 17.

33. *Ficus sp.* This is another species I have not been able to trace. It was a present from Dr. (now Sir John) Hay, of Sydney, a well-known plant connoisseur. Its origin does not appear to be known.

Our plant is about fifteen years old. It is planted in a warm border and is a slender tree, 12 feet high (it has been lopped), with striking (to us) lanceolate leaves up to 11 inches long by 2 broad; channelled above, entire, perfectly glabrous.

L 5.

34. *Ficus sp.* Known in the Sydney Botanic Garden as the "White-barked Fig," and raised from seed many years ago from a supposed *F. rubiginosa* (it may not be *F. rubiginosa* at all) in the area now known as Cook Park.

It has been very largely distributed during the last few years by nurserymen and others.

It is quite distinct from typical *F. rubiginosa*, the leaves being narrower, more lanceolate, and with no sign of rustiness. It more readily forms a handsome tree than the latter species. The fruits are small (apparently a little smaller than those of *F. rubiginosa*) and yellow. Its habit is more pendulous than *rubiginosa*.

There are three specimens in the Garden Palace Grounds, viz.:—One adjoining the small fountain (with a basin) not far from the Domain; a second

a little north of the main flight of steps, and overlooking the bank; the third on the lawn a little to the north of the Governor Phillip fountain. See photo.

34. Ficus sp.
Botanic Gardens, Sydney.

I desire to invite attention to the following species which, it would appear, should be introduced into New South Wales:—

F. cordifolia, Blume. Native of Java. Gamble, "Manual of Indian Timbers," 1902 Edition, p. 64, refers to it. See also King's remarks at p. 180 of vol. i of *Ann. Bot. Gard.*, Calcutta.

F. lanceolata, Ham. Native of Burma. See t. 224 of vol. i of *Ann. Bot. Gard.*, Calcutta.

F. quercifolia, Roxb. Native of the Malayan Peninsula. See t. 95 of vol. i of *Ann. Bot. Gard.*, Calcutta.

The Type and Colour of the Modern Jersey.

M. A. O'CALLAGHAN.

THE two illustrations given will serve as an interesting study for some of our Jersey breeders and judges. If either of these animals were exhibited in New South Wales, especially at country exhibitions, there is little doubt but that they would be passed over by the judge and classed as grade Jerseys owing to the amount of white showing in their colour, and more especially owing to the positions in which the white patches are placed. As a rule we are accustomed to see any white patches confined to the flanks and underneath

From "Hoard's Dairyman." **Golden Fern's Sensation.**
Grand Champion Jersey Cow at National Dairy Show. Owned by A. B. Lewis, Virginia.

portions of the body; but here the streak of white, in one instance, extends right from underneath the forearm to the shoulder, while in the other there is a large patch of white on the shoulder, a large star on the forehead, and a considerable amount of white on the right thigh and flank. Yet these cows won first place in competitions of considerable consequence; the one was a Grand Champion in the Jersey Cow Class at the United States National Dairy Show, which was held in Virginia, while the other was First and Champion in the Jersey Cow Classes at the Oxford County Show, and is the property of that well-known breeder, Lord Rothschild. As a rule, one prefers to see whole coloured animals winning first places in Jersey classes; but, if we bear

in mind that only about 10 per cent. of the original cows placed in the first Jersey register, in the Island of Jersey, were without white markings, we will not be surprised when an animal of undoubted pedigree is presented bearing white marks. Do what we can to breed whole coloured animals, now and again our very best cows will throw back and give us calves showing a considerable amount of white.

Types:—The English-bred cow "Sultana 24th" is a very good illustration of what we recognise as the vigorous or English-bred type of Jersey—an animal that is considerably stronger and more robust-looking than her island-bred sister. It is this robust type that we so much need in Australia, because we require the animals for use only. Their beauty is a very secondary consideration to the dairy farmer. With him "Handsome is as hand-

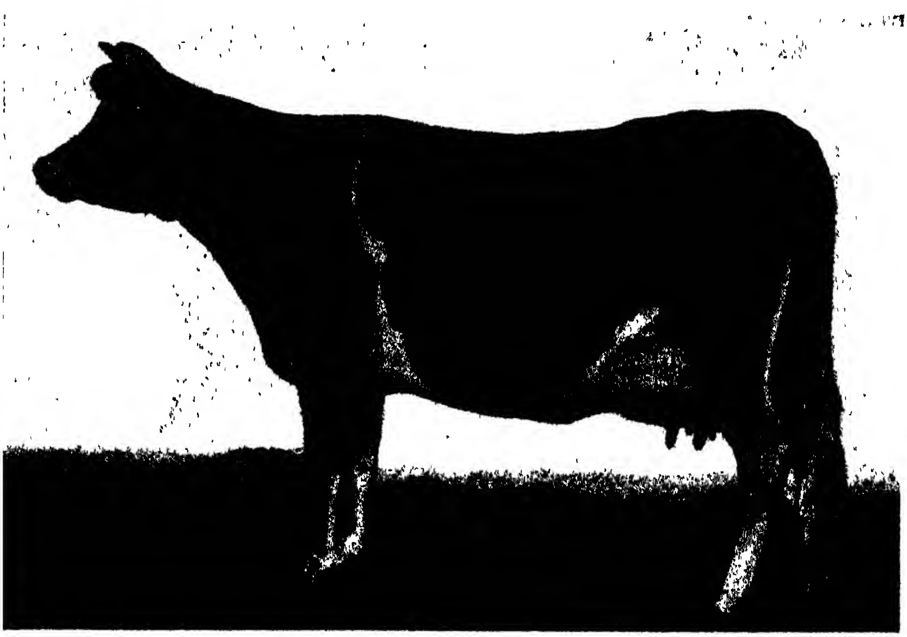


Photo by F. Babbage. **Jersey Cow, Sultana 24th.**
First and Champion at the Oxford County Show. The property of Lord Rothschild, Trigg Park, Herts.

some does," and the Jersey cow which does not yield a large quantity of butter fat has no beauty in his eyes, even though her head may be beautiful and her frame deerlike and handsome.

The American cow illustrated is also the strongly constituted type—though carrying very little flesh at the time this photograph was taken. If judges of Jerseys at New South Wales Shows can be induced to place the dairy type as the first consideration—provided, of course, the animals are pure bred,—we shall have, in time, produced an animal fulfilling all the requirements of the modern dairy farmer.

Experimental Test of Treatments for Worms in Sheep at Glen Innes Experiment Farm.

MR. R. H. GENNYS, Manager of the Experiment Farm, Glen Innes, having recommended that a certain proprietary drench for lung-worms in sheep be tested upon some infested sheep at the Farm, it was approved that the opportunity be embraced to carry out a series of experiments in connection with the various methods usually recommended for the treatment of lung-worms in sheep. In pursuance thereof Mr. Max Henry, M.R.C.V.S., Government Veterinary Surgeon, was instructed to proceed to Glen Innes and make necessary arrangements to carry out the work. Mr. Henry was directed to divide the number of sheep at the Farm into various lots, so that the following treatments might be tested in an equal manner, viz.:— Dosing with Proprietary Drench No. 1 and Proprietary Drench No 2; by intra-tracheal injections; by fumigation; and by feeding on artificial grasses. A certain number of the infested sheep were to be retained under ordinary natural conditions as "control animals." Also one sheep from each lot was to be specially marked, in order that a record of its weight might be kept during the test.

As the sheep were also found infested with stomach and intestinal worms, Mr. Henry extended his observations to the effects of the various treatments upon these parasites.

A few days before the conclusion of the test, two drenches were dispensed in accordance with the Departmental formula for the arsenical drench, and were forwarded to the Manager of the Farm, to be given to two infested sheep that were not under treatment. An accident, however, occurred whilst drenching one of the sheep, and the animal died soon afterwards. This was unfortunate, as accidents of this kind very seldom occur, and the arsenical drench has been used so long and by such a large number of stock-owners that its efficiency in dislodging stomach worms cannot be questioned, and as a rule, sheep suffer no inconvenience from this treatment, providing the ingredients are mixed and the drench administered in a proper manner.

It is generally recognised that complete expulsion of worms infesting the lungs of sheep is difficult to accomplish by medicinal remedies, but the immediate result of the intra-tracheal injections and fumigation is the expulsion by coughing of a number of the parasites, and temporary relief afforded. One need only carefully open up the bronchial tubes of lungs badly infested with the thread worms and observe the tangled masses of myriads of these parasites occluding the lumen of the passages, to appreciate the fact that successful results are only obtainable by treatment prolonged and systematically applied.

Probably the most effective treatment of all is the administration of the arsenical drench to destroy worms infesting the stomach, followed by a

liberal allowance of nutritious food, and sulphate of iron and salt lick *ad lib.* It is also most desirable that the preventive measures recommended in the *Agricultural Gazette* of October, 1900, should be applied, as far as practicable, as the accepted doctrine that "prevention is better than cure," is well exemplified in connection with worms in sheep.

Mr. Henry's report, summarising the results of his observations at the recent experiment, is attached herewith. Next year it is proposed, should conditions be propitious for the purpose, to continue to carry out a further series of tests of the different methods of treatment in respect of these parasites. The assistance of stock-owners and persons interested in this work will be gladly availed of by this Department.

JAS. D. STEWART, M.R.C.V.S.,
Chief Inspector of Stock.

Stock Branch, Department of Agriculture,
29th October, 1908.

I HAVE the honor herewith to submit my report on the experiments recently carried out at Glen Innes on "Lung-worm in Sheep"

These experiments were commenced on 19th September, 1908, at the Experiment Farm, Glen Innes, when forty-three sheep, got together by Mr. Gennys, the Manager, as being affected with "lung worm," were in one way or another, brought within the scope of the experiment. The sheep were mixed merinos and cross-breds, forty-two about 11 months and one about two years old, the property of the Experiment Farm and of Mr. Davidson, a neighbouring farmer, who very kindly provided them for experimental purposes. All the sheep were in poor condition, many with a constant cough, and some showing marked œdema between the lower jaws. In order to discover the extent of the infestation, three were killed, with the following results:—Sheep No. 1: 11-month merino; very poor, with marked œdema between the jaws. On *post mortem* examination there was found considerable abdominal fluid, the lungs were slightly mottled, no nodules, and on section the bronchi and bronchioles were found to be badly infested with strongyles; the rumen, reticulum, and omasum were normal, but a considerable number of strongyles (stomach worms) were found in the abomasum, the cæcum also containing large numbers of thin white worms, otherwise the intestines appeared normal. The liver and spleen were normal, but the kidneys on section were pale, especially the medulla. On examination, the strongyles proved to be in the bronchi and smaller air-passages, *strongylus filaria;* in the 4th stomach, *strongylus contortus,* while the worms in the cæcum were the *trichocephalus affinis.*

Sheep No. 2.—11 months, cross-bred; in fair condition, and without œdema. The *post mortem* appearances were as in No. 1, save that no other parasite was found besides the *st. filaria* in the lungs, and the kidneys were normal.

Sheep No. 3.—2 years old; similar to No. 2, but the lung infestation was very bad, and many worm nodules were found in the mucous membrane of

the intestines (due to *œsophagostoma columbianum*). Microscopical examination of the mucous from the bronchi of this sheep revealed ova and embryos of the *st. filaria* in immense numbers, and in all stages of development.

The remaining forty sheep were treated as follows:—

Lot 1.—Three sheep received the following injection intra-tracheally:—

Ol. Tereb: ♏ xx.
Ol. Creasoti: ♏ x.
Chloroform: ♏ x.
Ol. Olivae: ʒi.

Lot 2.—Six sheep were drenched with Proprietary Drench No. 1.

Lot 3.—Six sheep were drenched with Proprietary Drench No. 2.

Lot 4.—Six sheep were drenched with 2 oz. of a mixture of turpentine, 1 part, and linseed oil, 2 parts.

Lot 5.—Six sheep were fumigated with ¼ lb. sulphur. They were fumigated for ten minutes, then, on showing signs of distress, the sulphur was withdrawn, and they were left for a further ten minutes in the fumes.

Lot 6.—Seven sheep were set apart to be fed on artificial grasses and lucerne, and given abundance of salt during the experiment.

Lot 7.—Six sheep were left untreated as controls.

All the sheep were marked for purposes of identification, and, with the exception of those put on artificial grasses, were kept under identical conditions.

In ten days' time the above treatment was repeated, and the results obtained are as follows:—

WITH regard to "Lung-worm."

Lot.	When killed.	No. killed.	Results.
1	At 10 days, after 1 injection ...	3	(1) No worms found. (2) A few worms found. (3) Do do
	At 20 days, after 2 injections ...	1	No worms found.
2	At 10 days, after 1 drench ...	1	A few worms found.
	At 20 days, after 2 drenches ..	2	(1) Many worms found. (2) A few worms found.
3	At 1) days, after 1 drench ...	1	Many worms found.
	At 20 days, after 2 drenches ...	2	(1) Many worms found. (2) No worms found.
4	At 10 days, after 1 drench ...	1	A few worms found.
	At 20 days, after 2 drenches ...	2	(1) Many worms found. (2) No worms found.
5	After 1 fumigation	1	Very few worms found.
	After 20 days, and 2 fumigations	2	(1) Very few worms found. (2) Do do

WITH regard to "Lung-worm"—*continued.*

Lot.	When killed.	No. killed.	Results.
6	After feeding 10 days	1	A few worms found.
	After feeding 20 days	2	(1) Very few worms found.
			(2) Do do
7	Controls at 10 days	1	Worms found.
	At 20 days	2	Both infested.

In all cases the worms were alive and vigorous.

One sheep from each lot was weighed at the commencement of the experiment, at ten days and at twenty days.

RESULTS were as follows:—

Lot.	How treated.	Weight.			Increase.
		At start.	At 10 days.	At 20 days.	
		lb.	lb.	lb.	lb.
1	Intra-tracheal injections	39½	41¼	45½	6
2	With Proprietary drench No. 1 ...	30	31	32¼	2¼
3	Do do No. 2 ..	26½	died	......	......
4	With Turpentine drench	32	33¼	35¾	3¾
5	Fumigations	31½	33	36	4½
6	Fed on artificial grasses, with salt lick	33	36¼	42	9
7	Control	34¾	35½	34	dec. 0¾

So far, therefore, as these experiments go, the best all-round results were obtained from giving the sheep a liberal diet and a full allowance of salt. No one who had seen the sheep at the beginning of the experiment, and noted how they stood out above the others in general appearance at the end of the twenty days, could help admitting that intra-tracheal injections gave favourable results in regard to destroying the parasites, and the weighed sheep gained considerably, but this method cannot be taken into consideration for large flocks. Results from fumigation were somewhat disappointing, as in no case were all the worms got rid of. All the drenches failed equally to procure the expulsion of the parasites, and it is very doubtful whether any drench will prove successful, while the weighed sheep did not gain to nearly the same extent as those treated in other ways. Owing to the lateness of the season the positive results cannot be regarded as absolutely final, but this, of course, has no bearing on the failure of any of the methods of treatment.

As these sheep were also badly infested with stomach and intestinal worms—*Strongylus contortus* in the fourth stomach, *Trichocephalus affinis* in the cæcum, and *Œsophagostoma columbianum* in the cæcum and large colon—these experiments provided an opportunity of noting the effect of the various drenches on these parasites.

The following results were obtained:—

Lot.	How treated.	No. killed.	Worms found afterwards.
1	Inter-tracheal injections	4	Worms numerous in three, and some found in the fourth.
2	Dosed with Proprietary drench No. 1	3	Worms found in all three.
3	do do No. 2	3	do
4	do Turpentine drench ..	3	do
5	Fumigated	3	do
6	Fed on artificial grasses	3	do
7	Controls	3	do
8	Two sheep drenched with Departmental drench for stomach and intestinal worms.	2	In one, two worms were found after careful search. The other died from an accident in drenching.

Of those of the above sheep which were drenched, only two out of ten showed many stomach and intestinal worms on *post mortem*, but of those undrenched ten out of fifteen showed bad infestation, usually with at least two out of the three forms of stomach and intestinal parasites found.

There would, therefore, appear but little doubt that the drenches used caused some improvement in the stomach and intestinal infestation, but were unable to destroy all the worms present. The sheep treated with the departmental drench showed very good results, but unfortunately only one *post mortem* could be made.

In no case was there any evidence that any of the drenches used caused the slightest harm to the sheep; in fact, all the weighed sheep under treatment gained to some extent.

In conclusion, the results obtained would seem to emphasise again the fact that the giving of good feed and salt is the best treatment to apply to sheep affected with worm infestation of any description; that while stomach and intestinal worms can be dislodged fairly readily, bronchial parasites can be so only with great difficulty; and that stock-owners must look to preventive methods rather than to "cures" to save themselves from loss from this cause.

MAX HENRY, M.R.C.V.S.,
Government Veterinary Surgeon.

Dairy Science School at Berry.

A Dairy Science School was held under the superintendence of Mr. M. A. O'Callaghan, the Departmental Dairy Expert, at the Berry Butter Factory early in August. Daily lectures were given by the Departmental experts, and instructions in cream grading, butter making, cream and milk testing, determination of water in butter, detection of preservatives in dairy products, and the elements of dairy bacteriology. The course was well attended, and at its conclusion an examination was held in the subjects upon which instruction had been given. Departmental Certificates have now been issued to the following, several of whom passed in two or more of the subjects:—Hill, M. A., Miller, J., Crawford, L., Tyer, H., Blackwood, H., Aldham, E., Tapper, Jas., Stoeckert, E. G., O'Neill, J. E., Barlow, H., Swannell, R. H., Hoskin, W. B., Barnett, Wm. J., Gosling, O. L., Vaughan, E. G., Muggridge, A. R.

Notes on Varieties of Fruit grown at various Departmental Orchards.

W. J. ALLEN.

Hawkesbury Agricultural College.

Peaches.

"Christiana."—These trees are worked on peach stock, and have been planted for eleven years. The fruit is large, and of delicious flavour. Skin pale yellow, rich red in the sun; flesh, yellow; freestone; suitable for dessert and drying. Bloomed 7th September; ripened 25th January; poor crop. Free from disease.

"Cumberland."—A very fine peach resembling Brigg's Red May, but, on account of its shy bearing, could not be recommended. Bloomed 11th September; ripened 28th November.

"Governor Garland."—Similar to Cumberland. A shy bearer. Bloomed 20th September; ripened 28th November.

"King's Perfection."—These trees are worked on peach stock, and have been planted for sixteen years. The fruit is highly coloured; clingstone, suitable for dessert. Bloomed 10th September; ripened 23rd January; free from disease. A good variety to grow for market.

"Sneed."—These trees are worked on peach stock, and are 7 years old. The fruit is of medium size, oval, creamy white in colour, with a red blush on sunny side. Freestone, suitable for dessert. Bloomed 7th September; ripened 19th November; free from disease; crop light. A good market variety on account of early ripening.

"High's Early Canada."—Worked on peach stock, and 7 years old. Fruit very large; skin yellowish, with markings of crimson; flesh greenish, tender and melting; a dessert variety. Bloomed 7th September; ripened 2nd December; free from disease. This variety is similar to Brigg's Red May, but much better. Very good for market, but so far inclined to be a shy bearer.

"Lady Ingold."—Worked on peach stock, and 7 years old. Fruit large and very even in form; skin rich yellow-crimson in sun; flesh yellow; freestone; suitable for dessert. Bloomed 3rd September; ripened 6th January; free from disease.

"Lord Palmerston."—Worked on peach stock, and 14 years old. Fruit above average size and pale in colour; flesh white and fine in texture; good flavour; clingstone. Bloomed 3rd September; ripened 10th February; free from disease. Fair crop, good quality.

"Thames Bank."—Bloomed 17th September. No crop set.

"Osprey."—Bloomed 17th September. No good.

"Exquisite."—Bloomed 13th September. No good.

"Warrington."—Bloomed 13th September. No good.

"Alexander."—Bloomed 18th September. No good.

"Red Italian."—Worked on peach stock and 12 years old. Fruit large; freestone; suitable for dessert and drying. Bloomed 7th September; ripened 7th February; free from disease; fair crop.

"Yellow Italian."—Worked on peach stock, and 14 years old. Fruit oblong, pointed, one-sided; skin deep yellow; flavour vinous; clingstone; suitable for canning. Bloomed 20th September; ripened 18th February; free from disease; good crop; good quality; catches the fruit fly.

"Kia-Ora."—Worked on peach stock, and 7 years old. Flesh yellow; freestone; suitable for dessert. Bloomed 27th August, during windy and frosty weather; ripened 15th January; free from disease; a seedling from Elberta.

"California."—Worked on peach stock and 12 years old. Fruit large; flesh yellow; clingstone; suitable for dessert, shipping, and canning. Bloomed 7th September; ripened 25th January; free from disease; crop medium; quality good.

"Lemon Cling."—Worked on peach stock, and 17 years old. Fruit medium to large, oblong; skin clear, lemon yellow with a tinge of red in the sun; colour yellow; clingstone; suitable for dessert, shipping, and canning. Bloomed 7th September; ripened 27th January; free from disease; medium crop; good quality.

"Henrietta."—Worked on peach stock, and 17 years old. Fruit large, rather flattened; skin, bright yellow; flesh, yellow: clingstone. Suitable for dessert, shipping, and canning. Bloomed 3rd September; ripened 20th January; free from disease; good crop; medium quality.

"Royal George."—Worked on peach stock, and 17 years old. Fruit large, round and even, pale, yellowish white; flesh whitish; freestone. Suitable for dessert; stone large. Bloomed 4th September; ripened 8th January; free from disease; good crop.

"Frazer's Newington."—Worked on peach stock, and 15 years old. Fruit very large and highly coloured; flesh greenish-white; clingstone. Suitable for dessert; stone large. Bloomed 14th September; ripened 8th January; free from disease; poor crop; poor quality.

"Noblesse."—Worked on peach stock, and 17 years old. Fruit large, but not worth growing, as it will not hang a day scarcely. Flesh greenish-white; clingstone; suitable for dessert. Bloomed 11th September; ripened 8th January; fair crop; free from disease.

"Eclipse."—Worked on peach stock, and 17 years old. Fruit large, but not much good; flesh whitish; freestone. Bloomed 11th September; ripened 1st February. Free from disease.

"Conkling."—Worked on peach stock, and 7 years old. Fruit large; flesh yellow; freestone; suitable for dessert and canning. Bloomed 11th September; ripened 10th January. Free from disease.

"Gold Dust."—Worked on peach stock, and 7 years old. Fruit very large and round; yellow, with a red cheek; flesh yellow; clingstone. Suitable

for dessert and canning. Bloomed 11th September; ripened 10th January. Free from disease.

"Early Newington."—Worked on peach stock, and 17 years old. Fruit large, and of good colour; clingstone. Suitable for dessert. Bloomed 11th September; ripened 15th January. Free from disease.

"Brigg's Red May."—Worked on peach stock, and 17 years old. Fruit of medium size; freestone. Suitable for dessert. Bloomed 7th September; ripened 27th November; good crop; poor quality. Free from disease.

"Early Crawford."—Worked on peach stock, and 17 years old. Fruit large, yellow, with red cheek; flesh yellow; freestone. Suitable for general purposes—dessert, drying, canning, and jam. Bloomed 7th September; ripened 8th January; good crop. Free from disease.

"Royal George" (Cling).—Worked on peach stock, and 17 years old. Fruit large, quite round, light yellow in shade, fine red in sun; flesh whitish, firm melting, rich flavour; clingstone. Suitable for dessert and canning. Good crop, good quality; good variety to grow. Bloomed 7th September; ripened 8th January. Free from disease.

"Foster."—Worked on peach stock, and 12 years old. Fruit large, deep orange red; flesh yellow, rich, and juicy; freestone; good crop, good quality; ripens a few days before "Early Crawford." A good variety to grow. Suitable for dessert, canning, and drying. Bloomed 7th September; ripened 8th January. Free from disease.

"Bidwell's Early."—Bloomed 3rd July. Never crops; only one or two peaches. No good here. This variety blooms when the frosts are very severe, and consequently suffers.

"Stieme's Nonpareil."—Worked on peach stock, and 17 years old. Skin pale white, with slight blush of red; flesh whitish; freestone. Suitable for dessert. Bloomed 27th August; ripened 9th January. Good crop, good quality. Free from disease.

"Fulton."—Worked on peach stock, and 17 years old. Fruit large, roundish, very pale yellow; flesh firm, white, rich, and juicy; clingstone. Suitable for dessert. Bloomed 27th August; ripened 11th February; medium crop. Free from disease.

"Cooper's Seedling."—Worked on peach stock, and 17 years old. Fruit medium size, reddish; flesh whitish; clingstone. Suitable for dessert. Bloomed 27th August; ripened 12th January. A good market variety; good crop and quality. Free from disease.

"Susquehanna."—Worked on peach stock, and 17 years old. Fruit large, almost globular, deep yellow with red in sun; flesh deep yellow, fine grained, tender; freestone. Suitable for dessert and drying. Bloomed 27th August; ripened 15th January. Poor crop, fair quality. Inclined to be a shy bearer here. Free from disease.

"McDevitt's Cling."—Worked on peach stock, and 7 years old. Fruit large, even-shaped, deep rich yellow, covered with dark purple; clingstone. Suitable for dessert and canning. Bloomed 24th August; ripened 1st February. Crop medium; good quality. A good variety to grow. Free from disease.

"Hale's Early."—Worked on peach stock, and 16 years old. Fruit medium sized, roundish, pale yellowish white, deep red in sun; flesh greenish white, tender; freestone; suitable for dessert. Bloomed 27th August; ripened 8th December. Crop poor. This is a good early variety to grow for market. Free from disease.

"Carrington."—Worked on peach stock, and 17 years old. Fruit large, whitish; flesh firm, whitish; clingstone; suitable for dessert, shipping, and canning. Bloomed 23rd August; ripened 3rd February. Good crop, good quality; free from disease.

"Parramatta."—Worked on peach stock, and 17 years old; clingstone, suitable for dessert; good crop, medium quality. Bloomed 23rd August; ripened 24th January. Free from disease.

"Early Rivers."—Worked on peach stock, and 12 years old. Fruit medium sized, waxen white, clear carmine cheek; flesh whitish, clingstone; suitable for dessert. Bloomed 26th August; ripened 6th December. Good crop; good quality; inclined to bruise very readily when packed for market. Free from disease.

"Triumph."—Worked on peach stock, and 7 years old. Fruit large, yellow, nearly covered with red and dark crimson on sunny side; flesh yellow, rich; clingstone; suitable for dessert; earliest yellow-fleshed peach; regular cropper and prolific; a good variety to plant. Bloomed 26th August; ripened 5th December. Free from disease.

"Late Seedling."—Bloomed 26th August; never matures properly, and is generally attacked by fly. No good.

"Globe."—Worked on peach stock, and 7 years old. Fruit very large, quite round, bright golden colour, with deep crimson cheek in sun; flesh tender, melting, rich and spicy; freestone; suitable for dessert, canning, and drying. Bloomed 28th August; ripened 1st February. Good crop; good quality; a very good variety. Free from disease.

"Elberta."—Worked on peach stock, and 7 years old. Fruit very large, yellow, and red; flesh yellow and richly flavoured; freestone; suitable for dessert, shipping, drying, canning, and jam. Bloomed 25th August; ripened 8th January. Good crop, best quality. This is undoubtedly the best peach of its season, being useful for all purposes. A good variety for private gardens. Free from disease.

"Mountain Rose."—Worked on peach stock, and 12 years old. Fruit large, whitish yellow, almost covered with clear bright red; flesh whitish, tender, very rich; freestone; suitable for dessert. Bloomed 27th August; ripened 2nd January. Good crop; quality medium; a good variety to grow. Free from disease.

"Brandywine."—Worked on peach stock, and 7 years old. Fruit large; flesh yellow; freestone; suitable for dessert, shipping, and canning. Bloomed 27th August; ripened 1st February. A very good peach to grow. Good crop, good quality. Free from disease.

"Lovell."—Worked on peach stock, and 12 years old. Fruit large, round; flesh yellow, rich; freestone; suitable for dessert, canning, and drying.

Bloomed 27th August; ripened 8th January. Medium crop; good quality. Free from disease.

"Wiggins."—Worked on peach stock, and 5 years old. Fruit of good size, whitish, with fair amount of red; flesh whitish, rich and juicy; freestone; suitable for dessert. Bloomed 27th August; ripened 24th December. Valuable for its season of ripening. Good crop; poor quality. Free from disease.

"Borance."—Worked on peach stock, and 16 years old. Dessert variety. Bloomed 27th August; ripened 10th January. Poor crop. Free from disease.

"Thurber."—Worked on peach stock, and 11 years old. Fruit large, creamy white; flesh fine-grained, white, red at stone, rich and delicious in flavour; freestone; suitable for dessert. Bloomed 23rd August; ripened 1st February. Free from disease.

"Wonderful."—Worked on peach stock, and 7 years old. Fruit, large, oblong, golden yellow, carmine cheek; flesh yellow, tender, rich and juicy; freestone; suitable for dessert. Bloomed 25th August; ripened 1st February. Medium crop. Free from disease.

"Bonanza."—Worked on peach stock and 7 years old. Fruit large, round and even, almost white in shade, carmine cheek; flesh white; freestone; suitable for dessert. Bloomed 25th August; ripened 12th February. Free from disease.

"Salwey."—Worked on peach stock, and 4 years old. Fruit medium sized, round, yellow, fine red in sun; flesh fine, yellow, and with a flavour peculiar to itself; freestone; suitable for dessert and canning. Bloomed 25th August; ripened 12th February. Good crop; fair quality. A good late peach. Free from disease.

"Camden's Golden."—Fruit large, clear golden colour, bright red cheek; flesh yellow, firm, melting, rich and sugary; freestone; suitable for dessert. Bloomed 28th August; ripened 12th February. Free from disease.

"Picquet's Free."—Bloomed 28th August; no crop set.

"Chair's Choice."—Worked on peach stock, and 7 years old. Fruit large, deep yellow with red cheek; flesh yellow, firm; freestone; suitable for dessert and canning. Bloomed 28th August; ripened 1st February; good crop; good quality; a very good late variety; free from disease.

"Nichol's Orange Cling."—Worked on peach stock, and 7 years old. Fruit large, round, deep orange, with rich red cheek; flesh deep yellow, firm; clingstone; suitable for dessert and canning. Bloomed 27th August; ripened 1st February. Crop poor; good quality; very fine canning peach; free from disease.

"Prize."—Worked on peach stock, and 7 years old. Fruit large, highly coloured; flesh yellow; freestone. Bloomed 23rd August; ripened 23rd January. Similar to Kia-Ora and Champion, ripening same time; free from disease.

"Roser."—Bloomed 27th August; no crop set.

"Beer's Smock."—Bloomed 27th August; no crop set.

"King Edward VII."—Bloomed 27th August; no crop set; planted in 1907.

"Lady Palmerston."—Worked on peach stock, and 14 years old. Fruit medium to large, quite round, greenish yellow, deep red cheek; flesh, pale yellow, tender; freestone; suitable for dessert, shipping and drying. Bloomed 7th September; ripened 4th February. Good crop; good quality; a very fine variety to grow; free from disease.

"Muir."—Worked on peach stock, and 14 years old. Freestone; suitable for canning and drying. Bloomed 7th September; ripened 8th January. Good crop; good quality. This peach on sandy ground is spoilt on account of skin collecting all sand that blows; free from disease.

"Stump of the World."—Bloomed 7th September; not true to name.

"Comet."—Worked on peach stock, and 14 years old. Fruit large, round, with slight point, fine yellow, deep red in sun; flesh deep yellow, juicy, melting, vinous flavour; freestone; suitable for dessert, canning, and drying. Bloomed 7th September; ripened 10th February; good crop; good quality; free from disease.

"Yellow St. John."—Worked on peach stock, and 14 years old; freestone. Bloomed 7th September; ripened 23rd of December; good crop; good quality; valuable for its season; free from disease.

"Heath's Cling."—Bloomed 7th September; no crop set.

Apricots.

Planted, August, 1905.

"Early Moorpark"	Making	rapid	growth;	poor show	for fruit.
"Red Masculine"	,,	good	,,	fair	,,
"Ouillin's Early"	,,	,,	,,	poor	,,
"Large Early"	,,	,,	,,	no	,,
"Newcastle"	,,	,,	,,	light	,,
"Bobby Allen"	,,	,,	,,	very good	,,
"Harris"	,,	very fair	,,	,,	,,
"Royal"	,,	,,	,,	,,	,,
"Royal George"	,,	good	,,	moderate	,,
"Pennant Hills"	,,	,,	,,	good	,,
"Turkey"	,,	,,	,,	very fair	,,
"Hemskirke"	,,	,,	,,	good	,,
"Mansfield Seedling"	,,	,,	,,	poor	,,
"St. Ambroise"	,,	,,	,,	,,	,,
"Shipley's Blenheim"	,,	,,	,,	very fair	,,
"Hatif D'Auvergne"	,,	,,	,,	no	,,
"Canino Grosso"	,,	,,	,,	fair	,,
"Carrington"	,,	,,	,,	,,	,,
"Campbellfield's Seedling"	,,	,,	,,	,,	,,
"Elruge"	,,	,,	,,	,,	,,
"Warwick"	,,	,,	,,	very fair	,,
"Pineapple"	,,	,,	,,	good	,,

"Kaisha"	Making	good	growth;	good	for fruit.
"Dundonald"	,,	,,	,,	fair	,,
"Montgamet"	,,	fair	,,	no	,,
"Rivers Large Red"	,,	good	,,	very fair	,,
"California Royal"	,,	very good	,,	no	,,
"Temple's Moorpark"	,,	,,	,,	fair	,,
"Angoumois Hatif"	,,	,,	,,	no	,,
"Large Orange"	,,	,,	,,	poor	,,
"Roman"	,,	,,	,,	fair	,,
"Luizet"	,,	,,	,,	no	,,
"Camden Pale Superb"	,,	,,	,,	poor	,,

Figs.

The following three varieties of figs have fruited; they were planted in August, 1905 :—"Verdal Longue," "San Pedro White," "San Pedro Black."

Nectarines.

"Stanwick."—Bloomed 27th August. No crop.

"Spencer."—Bloomed 27th August. No crop.

"Hardwicke"—Worked on peach stock, and 12 years old. Fruit large, roundish, inclining to oval; skin pale green, with red cheek. Slightly red at stone; freestone. Suitable for dessert, canning, and drying. Bloomed 27th August; ripened 3rd January. Free from disease; good crop; good quality. A very good late variety.

"Irrewarra."—Worked on peach stock, and 12 years old. Fruit, medium and above in size; highly coloured; flavour splendid; freestone. Suitable for dessert. Bloomed 7th September; ripened 3rd December. Free from disease; very light crop.

"Rivers' Early."—Worked on peach stock, and 12 years old. Fruit of largest size; skin, light yellow, marked with red; rich crimson in sun; flesh tender and juicy; rich flavour; freestone, suitable for dessert. Bloomed 7th September; ripened 7th December. Free from disease; medium crop; a very good variety; inclined to be a shy bearer.

"Victoria."—Bloomed, 7th September. No crop.

"Newton."—Worked on peach stock, and 12 years old. Fruit, very large, round; flesh white, sugary; flavour, rich and delicious; freestone; suitable for dessert. Bloomed 7th September; ripened 20th January. Free from disease; good crop; good quality; good variety.

"Milton."—Worked on peach stock, and 12 years old. Bloomed 7th September; ripened 6th January. Similar to Newton; earlier.

"Dryden."—Bloomed 7th September. No crop.

"Balgowan Late."—Bloomed 7th September. No crop.

"Hunt's Tawny."—Worked on peach stock, and 16 years old. Fruit, medium to large, round; skin, pale orange and deep red; flesh, orange

coloured ; flavour, rich and juicy ; freestone ; suitable for dessert. Bloomed 7th September ; ripened 10th January. Free from disease ; crop large ; quality poor.

"Goldmine."—Fruit of very large size ; skin purple, with bright, bronzy red ; flesh, sugary and melting, cream coloured ; freestone ; suitable for dessert ; small stone. Bloomed 10th September ; ripened 13th December. Free from disease ; small crop ; good variety.

"Cardinal."—Worked on peach stock, and 7 years old. Fruit, large and brilliant in colour ; freestone ; suitable for dessert. Bloomed 10th September ; ripened 9th December. Free from disease ; crop, medium ; good early variety.

"Lord Napier."—Worked on peach stock, and 16 years old. Fruit, medium to large, inclined to oval ; skin yellowish, covered with vermilion ; freestone ; suitable for dessert, canning, and drying. Bloomed 5th September ; ripened 8th January. Free from disease ; good crop ; good variety.

"Meek's Scarlet."—Worked on peach stock, and 12 years old. Fruit, medium to large, oval, dark red ; freestone. Bloomed 7th September ; ripened 8th January. Free from disease ; good crop ; good quality.

"New White."—Bloomed 7th September. Cannot recommend for here. Cracks open in the rain.

"Elruge."—Worked on peach stock, and 12 years old. Fruit, medium to large, roundish ; skin greenish, dotted with red ; flesh, fine grained and rich in flavour ; freestone ; suitable for dessert. Bloomed 10th September ; ripened 23rd January. Free from disease.

Grapes.

"Mrs. Pearson's Golden Queen."—A mid-season variety of strong habit, re-worked on wine grapes, and more suitable for trellis than stakes. Berry of medium size, round, amber in colour, and with tough skin ; flavour, slightly Muscat ; quality good. Free from disease.

All the vines were sprayed with sulphuric acid solution in August ; again, the second week in September, with Bordeaux mixture (winter strength) ; and, again in November, with the latter mixture (summer strength).

"Temperano."—An early dessert variety of strong habit, re-worked on wine grapes, and suitable for trellis. The bunches are large, regular in form, but rather loose. Berry of large size, round, amber coloured, tender, soft, juicy ; flavour, fair ; quality fair. Free from disease.

"Red Portugal."—A late dessert variety of medium habit, re-worked on wine grapes. The bunches are long and fairly compact. Berry of large size, oblong, reddish black, fairly tough skin ; flesh, firm ; flavour, very good ; quality first-class. This is a very fine grape, and free from disease.

"Lady Downe's Seedling."—A late dessert variety of strong habit, re-worked on wine grapes. Bunches long and slender, rather loose. Berry of fairly large size, roundish, oval, black, thick-skinned, firm flesh ; flavour, rich ; quality only fair. This variety is not well-adapted to this locality.

"Green Gascoigne."—A large dessert variety, of strong habit, worked on wine grapes. The bunches are large, spreading in form and fairly compact. Berry under medium size, round, amber in colour, with fairly tough skin. Flesh juicy; flavour middling; quality middling. A very heavy cropper, and more suitable for trellis than stakes.

"Snow's Muscat Hamburgh."—A mid-season dessert variety of strong habit. Bunches long and loose; berry large; oval; deep purple; skin tender; flesh juicy and with a muscat flavour. Quality good. Free from disease.

"Gros Colman."—A late dessert variety of strong habit, re-worked on wine grapes. Bunches of medium length, branching and fairly compact. Berry large; round; purplish black; tough skinned; flavour fair; quality fair; free from disease. A heavy bearer and a good show grape.

"Duke of Buccleuch."—A mid-season dessert variety of strong habit, re-worked on wine grapes. Bunches of medium length, spreading and fairly loose. Berry medium; round; amber in colour; fairly tender; sweet and juicy; flavour good; quality good; free from disease. Fruits well here; should be grown on trellis.

"Centennial."—A mid-season dessert variety of strong habit, re-worked on wine grapes. Bunches of medium length and fairly loose. Berry very large; round; amber in color; skin fairly tender; flesh firm; flavour only fair; quality good; free from disease. Not bearing heavily here. Should be grown on trellis.

"Gordo Blanco."—A late raisin and dessert variety of medium habit. Bunches fairly long; shoulder compact; berry large; roundish; light yellow; skin fairly tender; flesh firm, with muscat flavour; quality good; fairly free from disease. One of the best white muscats.

"Syrian."—A late dessert variety of strong habit, reworked on wine grapes. Bunches long, branching and fairly loose. Berry large; oval: white; skin tough; flesh solid; flavour fair; quality fair; free from disease; bunches large; heavy bearer. Requires trellising.

"Calabrian Raisin."—Similar to Doradillo.

"Blue Imperial."—A mid-season dessert variety of strong habit. Bunches large and long, spreading; berry large, roundish, blackish purple; skin fairly tender; flesh juicy. Flavour good; quality good. Crops well. Suitable for trellis.

"Black Ferarra."—A late dessert variety of strong habit, re-worked on wine grapes. Bunches long, branching, and fairly compact. Berry large, roundish, black; skin tough; flesh firm; flavour good; quality good; free from disease. Should be on trellis.

"Mrs. Pearce's Black Muscat."—Not fruited yet.

"Royal Muscadine."—An early dessert variety of medium habit, re-worked on wine grapes. Bunches long and loose. Berry small, round, greenish yellow; skin tender; flesh juicy; flavour sweet; quality fair. Free from disease.

"Grand Turk."—A late dessert variety of very strong habit, re-worked on wine grapes. Bunches long and shouldered. Berry large, roundish, black; skin tough; flesh firm; flavour good; quality good; free from disease. Medium cropper on stakes. More suitable for trellis.

"Jerusalem."—Very similar to Grand Turk.

"Waltham Cross."—A late dessert variety of strong habit. Bunches long and fairly compact. Berry large, oblong, amber in colour; skin fairly tough; flesh firm; flavour good; quality good. Free from disease. Requires trellising.

"Black Tokay."—A late dessert variety of medium habit, re-worked on wine grapes. Bunches of medium length, spreading and fairly compact. Berry large, round, black; skin fairly tough; flesh firm and of good flavour; quality fair. Free from disease. A very heavy bearer.

"Malaga."—Not fruited yet.

"Crystal."—A late dessert variety of medium habit. Bunches of medium length and fairly compact. Berry large, round, pale amber; skin tough; flesh firm; flavour fair; quality fair. Free from disease.

"Gros Maroc."—A late dessert variety of medium habit. Bunches of medium length and slightly tapering. Berry large, rounded, blue-black; skin fairly tough; flesh firm. Flavour very good. Quality very good. Free from disease. Bears well. Fruit very attractive.

"Red Prince."—A mid-season dessert variety of medium habit. Bunches of medium length and fairly compact. Berry large, round, deep red; skin fairly tough; flesh firm; flavour good; quality good. Free from disease. A noble looking grape.

"Gros Guillaume."—A late dessert variety of very strong habit. Bunches long, shouldered and loose. Berry large, round, black; skin tough; flesh tender; flavour good, quality good. Free from disease.

"Alicante."—A late dessert variety of medium habit. Bunches of medium length, tapering and fairly loose. Berry large, oval, jet black; skin tough; flesh tender; flavour good; quality good. Free from disease.

"Daria."—Not fruited yet.

"Cornichon Blanc."—Not fruited yet.

"Royal Ascot."—An early dessert variety of medium habit. Bunches of medium length and compact. Berry of medium size, round, black; skin tender; flesh firm and juicy; flavour good; quality good. Free from disease.

"Flame Tokay."—A late dessert variety of medium habit. Bunches of medium length and compact. Berry large, oblong, red; skin fairly tough; flesh firm; flavour very good. Quality very good.

"Doradillo."—A late dessert variety of medium habit. Bunches of medium length, well shouldered and fairly compact. Berry of medium size, round, and amber in colour; skin tough; flesh firm; medium flavour and quality. Free from disease.

"Black Hamburgh."—An early dessert variety of medium habit. Bunches of medium length and fairly compact. Berry of medium size, roundish and black; skin tender; flesh juicy; flavour fair; quality fair. Free from disease.

Bathurst Orchard.

Cherries.

"De Boppard."—Upright, vigorous growth; first time trees fruited; a few specimens only, hanging chiefly in pairs. Medium to rather above medium size; oval, flattened on side; stalk medium length, set in a deep and rather narrow cavity; red, mottled with a lighter red; flesh very light pink, stained with red radiating from the stone; juice pink; stone not large, with flesh adhering. Lacking flavour, and split, which may have been caused by 25 points of rain just as fruit ripened. Ripe for market 4th October, 1907.

"Noir Precoce de Strass."—Tree fairly vigorous. Heavy crop; hanging in fours and threes; small oval, flattened on side; stalk medium length in shallow cavity; red, becoming very dark red as fruit becomes dead ripe; flesh reddish pink, rather soft; juice pink; stone large in comparison with size of fruit; very little flavour; cracked from rain just at ripening time; ripe for market 4th October, 1907. Too small for sale.

"Bigarreau Reverchon."—Trees stunted, delicate, spreading; heavy crop, mostly hanging singly; fruit large to very large; stalk short, stout; rounded heart-shape, slightly flattened on side; dark red with small brown specks and brown spot at apex; flesh firm, light red showing white veins; juice light red; stone medium size. A good marketable cherry and carries well, but trees are too delicate. Ripe towards end of December.

"Black Tartarian."—Trees stunted, spreading; heavy crop, fruit small; hanging in twos and threes, much clustered together; stalk varying much in length; heart-shaped, dark red, almost black when dead ripe; good flavour; flesh dark, juice red, fairly firm, but does not travel well. Ripe 20th November, 1907.

"Bigarreau de Hollande."—Trees spreading, stunted; heavy crop, fruit large, handsome, rather acid flavour; firm, but shows bruises badly, which affects its sale; flesh yellowish white. Ripe 10th December, 1907. Very similar to Napoleon.

"Elton."—Tree small, upright, making small but healthy growth; heavy crop, hanging singly and in pairs; stalk slender, about 1¾ inch long; fruit rather above medium size, pointed ovate, flattened on side; rather soft and liable to bruise in carriage, which spoils it for market; yellowish, slightly mottled with red; flesh whitish, juice clear; stone rather large; flavour good. Picked 14th November, 1907.

"Bigarreau Rockport."—Trees spreading, small, making little growth; heavy crop; fruit small, roundish, flattened, yellowish, almost covered with a red speck at apex; hanging singly and in pairs; stalk short, rather stout; flesh soft and whitish; juice clear, no flavour. Picked 18th November, 1907. Too small and soft for market.

"Centennial."—Heavy crop; fruit firm, medium size. Ripe end of December.

"Black Heart."—Trees stunted, spreading, heavy crop; very small fruit. Worthless.

"Governor Wood."—Vigorous, spreading, heavy crop, hanging in twos and threes; stalk short; fruit medium size, roundish heart-shaped; yellow, partly mottled with bright red; flesh yellowish; juice clear; stone small; good flavour; bruises too much for market. Ripe 27th November, 1907.

"Florence."—Upright, spreading, heavy crop, hanging in pairs; stalk slender, of medium length; fruit small; light red, turning much darker on hanging after ripe; flesh whitish; juice clear; good flavour; stone rather large; carries well. Ripe 6th December, 1907, but would hang a week later.

"Bigarreau de Mezel."—Trees vigorous, upright, spreading. No crop, 1907.

"Bigarreau Napoleon."—Upright, sagging with weight of crop; making very poor growth; very heavy crop, mostly in pairs; stalk rather short; fruit small, long, heart-shaped; glossy yellow, nearly covered with light red; firm, but shows bruises very badly, which makes it difficult to market. Ripe 4th December, 1907.

"Werder's Early Black."—Spreading, vigorous; fair crop; hanging singly and in pairs; stalk about 1½ inches long; fruit small, heart-shaped, flattened on sides; dark red, turning nearly black when dead ripe; flesh dark, juice purple. Ripe 12th November, 1907. Had complaints from buyers that fruit went wet in boxes when held a couple of days.

"Twyford."—Tree vigorous, upright, spreading; heavy crop; fruit hanging singly and in pairs; stalk slender and long; fruit rather above medium size; roundish, heart-shaped, flattened; flesh whitish, tinged with red near skin; juice clear; firm enough for market if picked in time; yellow, mottled with bright light red; flavour good. Ripe 11th November, 1907.

"St Margaret."—Trees rather stunted; heavy crop; fruit medium to large. Ripe end of December.

"Bohemian Black Bigarreau."—Upright, fairly vigorous, heavy crop, mostly in pairs; stalk medium; fruit large, heart-shaped, dark red, firm; flesh and juice purple; stone not large; flavour good, sub-bitter; marketed well. Ripe 10th December, 1907.

"Bigarreau Jaune de Drogan."—Tree upright (sagging with weight of crop); heavy crop, hanging in twos and threes; stalk rather long in narrow deep cavity; fruit large, round, obtuse, flattened on one side; whitish yellow, nearly covered with a glossy lively red; flesh nearly white; fairly firm; juice clear; flavour rather acid. Ripe 11th December, 1907.

"Early Rivers."—Tree vigorous, upright, spreading; heavy crop, hanging chiefly in twos and threes, stalk about 1½ inches long; fruit above medium to large, roundish, but broader than it is long; dark red, flesh dark red, and though appears firm, gives trouble in packing; juice purple. Ready for market 9th November, 1907.

"Belle d' Orleans."—Somewhat stunted, upright, spreading; heavy crop, mostly hanging in twos; stalk long; fruit small, roundish, hearted-shaped, and flattened on sides; glossy yellow, almost covered with bright light red;

flesh whitish, stained with light pink; juice clear; very insipid to taste; too soft for market. Ripe 12th November, 1907.

"Black Hawk."—Upright, vigorous; heavy crop, stalk medium to short; fruit large, dark, almost black; flesh dark, juice purple; soft, but toughens after picking; rich flavour. Ripe 23rd November, 1907.

"Toronto."—Upright, fairly vigorous; heavy crop, hanging in twos and threes; stalk medium; fruit small, heart-shaped, flattened on sides; dark red; flesh dark red; juice dark red; soft, and too small for market. Ripe 25th November, 1907. Not mentioned by authorities.

"Frogmore Bigarreau."—Upright, vigorous; heavy crop, hanging in twos and threes; stalk short in shallow cavity; fruit roundish, slightly flattened, medium size, bright glossy yellow, partly mottled with light red; flesh clear yellowish, juice clear; fairly firm, but looks as if it would show bruises; lacks flavour. Ripe 23rd November, 1907.

"Black Eagle."—Upright, fairly vigorous; heavy crop, hanging mostly in pairs; fruit medium size, heart-shaped, dark red, with spot at apex; flesh red, streaked with white; juice red; good flavour, but rather small and soft for market. Ripe 29th November, 1907.

"Bigarreau."—Tree stunted, spreading; heavy crop, mostly in pairs; stalk medium length in shallow cavity; fruit medium to large, rounded obtuse, heart-shaped; slightly flattened on one side; yellow, partly covered with a lively red blush and mottling; flesh yellow, good flavour, fairly firm, but shows bruises slightly. Ripe 9th December, 1907.

"Brant."—Upright, spreading, fairly vigorous; heavy crop, hanging in pairs, stalk medium length; fruit small, roundish, flesh reddish, and juice nearly clear; both skin and flesh darken on hanging after ripe; firm and good flavour, but too small for market. Ripe 25th November, 1907.

"Duke of Edinburgh."—(Not mentioned by authorities). Tree stunted, upright, spreading with weight of crop; too small and soft for market; very similar to Belle d' Orleans. Ripe 9th November, 1907.

"Kirtlands Mary."—Tree stunted, heavy crop, fruit small, light glossy yellow, partly covered with red; flesh yellowish, juice clear; firm and fair flavour, but too small for market. Ripe 26th November, 1907.

"Bedford Prolific."—Upright, vigorous; heavy crop, hanging in twos and threes, stalk long, fruit medium size, rounded, heart-shaped, dark red, fairly firm; flesh red. Ripe 30th November, 1907.

"Llewelling."—Stunted, upright; fair crop, hanging singly; stalk short and stout in deep narrow cavity; fruit rounded obtuse, heart-shaped, with suture sunk on one side and discernible right round; medium to large dark red with many small brown specks; flesh dark red. A very firm cherry, and should market well, but the trees are too stunted to carry payable crops. Ripe 12th December, 1907.

Apples.

"Wagener."—Heavy crop.

"Twenty Ounce."—Fairly upright, vigorous; fruit oblate, conic; large, yellowish green, with faint dull red streaks on one side; cavity deep, with

some russet; stem medium; basin deep, rather narrow and abrupt; eye closed; core axile, flesh greenish white, sub-acid. Bitter Pit rather bad. Picked early for cooking on this account.

"Melon."—Tree rather small; fruit roundish, one sided, medium to very large; yellowish green, with a delicate red blush and splashed with deeper red; cavity wide and rather deep; stem medium; basin narrow, eye shut; flesh white; flavour good. A dessert apple. Fair crop.

"Lord Nelson."—Tree spreading; fruit oblate, conic; large, pale greenish yellow, striped and splashed with two shades of red; cavity wide, shallow, sometimes rusty; stem short, basin shallow, eye flat, closed; core abaxile; flesh coarse, yellowish white. Only fit for cooking. Heavy crop.

"American Summer Pearmain."—Tree rather upright, dense; fruit conic; medium to rather above; yellowish green, faintly striped with dull red and many light dots; cavity wide, stem long, basin fairly deep, narrow and abrupt: eye closed, core axile; flesh white; flavour good, sprightly. Ripe from 30th January, 1908.

"Emperor Alexander."—Spreading, vigorous, stout growth; fruit oblate, conic, large; yellowish green with red blush, showing a faint stripe through it; cavity deep and wide; stem rather thick, fair length; basin rather shallow, eye closed; core abaxile; flesh greenish white, woolly, poor flavour. Only fit for cooking. Ripe 16th January, 1908. Heavy crop.

"Carolina Red June."—Tree large, spreading, vigorous; fruit oblate, conic, angular; medium to large; yellow, almost covered with a lively red; cavity wide, stem short, basin narrow, deep and ribbed; eye partially open, core abaxile, flesh white; flavour poor. Ripe from 30th January, 1908, to 15th February, 1908. Heavy crop. Only fit for cooking.

"Gravenstein."—Trees spreading, very little growth, stems and branches twisted; fruit oblate, irregularly angular; small to medium; yellow, mottled and striped with two reds; cavity wide, shallow; stem short, fleshy; basin mostly shallow; eye closed or partially so; core abaxile; flesh yellowish white, flavour good; good early dessert. Ripe from 14th January, 1908. Crop very light.

"Lord Suffield."—Upright, fairly spreading, vigorous; fruit oblate, conic, medium to large, whitish green with grey dots. Shows bruises easily. Cavity narrow, russetty; stem medium; basin shallow, slightly plaited; eye closed; core abaxile; flesh white, flavour acid. Ripe 14th January, 1908. An early cooking apple.

"Robinson's Seedling."—Tree spreading, fairly vigorous; fruit conic, truncated, small to medium; yellow, nearly covered with red and red stripes; cavity wide and rather deep; stem rather long, basin medium, eye open or partially so; core abaxile; flesh coarse, woody, greenish white. Heavy crop, ripe 12th February, 1908. A showy looking dessert apple, but its very poor quality would condemn it when known on the market.

"Margil."—Tree spreading, rather stunted; fruit oblate, conic, small; greenish yellow, almost covered with a dull red; cavity rather narrow and deep; stem medium to long; basin shallow, eye closed; core abaxile;

flesh greenish white, flavour good. Heavy crop. Ripe 14th February, 1908. An excellent dessert apple, but rather small for market.

"Ribston Pippin."—Tree spreading, vigorous; fruit irregular, conic, medium to large, dull yellowish green, splashed and blotched with dull red on one side; cavity wide, with some russet; stem short, basin medium, eye erect; core abaxile; flesh greenish white, flavour good. Attacked by Bitter Pit. Heavy crop. Ripe 27th January to 10th February, 1908. An excellent dessert apple, but not of very attractive appearance, and falls from tree very badly.

"Adams Pearmain."—Spreading, rather stunted; fruit oblong, conic, medium, a few only very large; yellowish green, shaded dull red and many light dots; cavity narrow, angular; stem medium; basin abrupt, wide; eye closed or partially so; core abaxile; flesh rather woolly, white. Heavy crop, picked 12th February, 1908.

"Ben Davis."—Fairly upright, large tree, but making little growth; fruit roundish, conic, small to medium; yellowish green, nearly covered with bright red and red stripes; cavity medium, stem medium, basin medium but abrupt; eye closed, core axile; flesh dense, rather tough, whitish; poor flavour. Heavy crop. Picked from 18th February, 1908. A poor quality dessert apple.

"Claygate Pearmain."—Spreading, rather stunted; fruit conic, medium size; yellowish green, with a pale red blush and stripes, many light dots; cavity shallow, wide; stem short, thick; basin rather wide and abrupt; eye open; flesh granular, yellowish white, sub-acid, good flavour. Ripe from 16th February, 1908. Fair crop.

"Blenheim Orange."—Spreading, fairly vigorous; fruit large, oblate, angular; fair crop; drops very badly before it colours at all.

"Cox's Orange Pippin."—Tree upright, fairly vigorous; fruit oblate, conic, medium size; greenish yellow with a red blush and red stripes and many light dots; cavity very shallow; stem short and often fleshy; basin shallow, slightly plaited; eye closed and core abaxile; flesh white, flavour excellent; Water Core prevalent; a few specimens only on the trees. Ripe 21st February, 1908. An excellent dessert apple but irregular bearer.

"Worcester Pearmain."—Tree vigorous, fairly spreading; fruit oblate, conic, angular, medium to large; green, nearly covered with a dark red, obscurely striped and some light dots; cavity wide with a green russet; stem short and thick, basin shallow, eye closed; core axile; flesh white, good flavour; fair crop; ripe 30th January, 1908.

"Cellini."—Spreading, fairly vigorous; fruit conic, oblate; flattened at base and apex; small, greenish yellow, mottled and striped with red; cavity shallow; stem short and rather thick; basin shallow, plaited; eye open, wide segments; core axile; flesh white, poor flavour; heavy crop, picked from 27th January to 20th February, 1908; only a poor quality dessert.

"Scarlet Queen."—Tree fairly spreading, vigorous; fruit oblate, small, yellowish, nearly covered with lively red and red stripes; cavity medium; stem medium; basin narrow, slightly plaited, eye closed; core axile; flesh

greenish white, fair flavour; heavy crop; picked from 12th February, 1908; a fair dessert apple, but rather too small for market; not mentioned by authorities, but identical with Scarlet Queen of Wagga Experiment Farm.

"Charleton Pippin."—Tree fairly spreading, vigorous; fruit oblate, flattened at the base and apex; medium size; yellowish green with russet and green dots; cavity shallow, stem short, basin abrupt, rather deep; eye slightly open; core axile; flesh white, flavour good; light crop; ripe 10th February, 1908; it lacks colour as a dessert apple; not mentioned by authorities.

"Hoary Morning."—Tree vigorous; fruit conic, medium to large, yellow, covered with two shades of red stripes and splashes and a thin white bloom; cavity narrow, stem short, basin deep and narrow; eye closed; core axile; flesh yellowish, sub-acid flavor. Ripe 14th February, 1908; fair crop; a good dessert apple.

"Cornish Gilliflower."—Fruit oblong, conic, very large; dark green, shaded and striped with dull red on one side; cavity rather deep; stem rather long, basin shallow; eye closed; core abaxile; flesh greenish white; attacked by Water Core and Bitter Pit; no specimens ripened.

"Cowell's Red Streak."—Tree upright, vigorous; fruit conic, symmetrical small, yellow, partly covered with red mottling and faint red stripes; cavity rather deep, with a little russet; stem medium, basin shallow, plaited, eye closed; core abaxile; flesh white, fair flavour. Water Core prevalent. Heavy crop. Ripe 22nd to 31st January, 1908. Too small for market. Not mentioned by authorities.

"Smoke House."—Tree spreading, vigorous; fruit oblate, large, yellowish green, with many light spots, thickest about the eye; cavity wide, rather shallow, with distinct ribs; stem rather long; basin wide, shallow, plaited; eye closed. Bitter Pit slightly. Picked early for cooking to avoid Bitter Pit.

"Stone's Seedling."—Fairly oblique, spreading, vigorous; fruit oblate, conic, large, yellowish, nearly covered with red stripes; cavity wide; stem medium; basin narrow; eye closed, or partly so; core abaxile; flesh yellowish white; flavour fair. Bitter Pit very bad; destroyed whole crop.

"Brittle Sweet."—Upright, vigorous; fruit conic, even in outline, large, yellow, with many light dots, smooth; cavity medium, russetty; stem short; basin rather deep, not wide, slightly plaited; eye closed, or nearly so; core axile; flesh, tender, white, fair flavour. Water Core prevalent. Light crop. This apple lacks colour, as described by Downing.

"Lake."—Upright, vigorous; fruit oblate, conic, small to medium; yellowish green, with red and red stripes on one side; cavity narrow; stem short; basin narrow and deep; eye closed; core axile; flesh granular, white, fair flavour. Water Core prevalent. Ripe 16th February, 1908. A few specimens only. Soon goes soft after picking.

"Richard Love."—Very large, conic, irregularly ribbed; green, sometimes with a faint reddish blush; cavity wide and deep; stem medium; basin furrowed, rather deep; eye partially closed; core axile; flesh greenish white; flavour acid. Fair crop. Picked 18th February, 1908. Not mentioned by authorities.

"Beauty of Kent."—Upright, vigorous; fruit oblate, conic, irregular, and ribbed towards the eye; large, yellowish green; cavity shallow, wide, with light russet; stem short; basin narrow; eye closed; core abaxile; flesh greenish white. Bitter Pit prevalent. Light crop; picked early for cooking to avoid Bitter Pit.

"Duchess Oldenburg."—Upright, small growth; fruit oblate, flattened at apex and base; large; greenish yellow, striped with red; cavity deep; stem medium; basin rather wide, abrupt; eye closed; core not large, axile; flesh tender, greenish white; flavour rather good.

"Chenango Strawberry."—Upright, dense, vigorous; fruit conic, oblong, pinched in near apex, medium to large, yellowish white, mottled and splashed with red and some light dots; cavity deep, angular; stem medium; basin rather wide and deep; eye open, or partially so; core axile; flesh greenish white; flavour good. Bore few good specimens only; ripe 4th February, 1908.

"Mank's Codlin."—Tree small upright; healthy but light growth; fruit conic, small to medium, whitish green, sometimes with a red blush; cavity, wide, shallow; stem, short, thick; basin, narrow, irregularly plaited; eye, closed; core axile; flesh, greenish white; flavour sub-acid; heavy crop; rather too small an apple to class as a cooker, and too acid for dessert; ripe, 14th January, 1908.

"King of Pippins."—Upright, vigorous; fruit, oblate, conic, flattened at top and bottom, medium size; yellow, striped with red and many light dots; cavity, shallow, wide; stem, short, thick; basin shallow, wide; eye open; flesh white; fair crop; falls badly. Ripe from 8th February, 1908.

"Family."—Upright, vigorous; fruit, oblate, conic, angular, medium size; yellowish green, nearly covered with red mottling and stripes and many light dots; cavity deep and wide; stem rather long; basin narrow, slightly plaited; eye closed; core axile; flesh greenish white; flavour sub-acid; ripe from 1st February, 1908; fair crop. An attractive dessert apple. Early, but soon goes mealy after picking.

"Reinette Fawbs d'Accuba."—Upright, vigorous; fruit roundish, somewhat conic; medium to large; pale greenish yellow, nearly covered with red blush and red streaks; cavity deep; stem medium; basin narrow, slightly plaited; eye closed; core axile; flesh yellowish white, sub-acid; fair crop; goes soft soon after picking. Not mentioned by authorities.

"Washington."—Upright, spreading; fruit roundish, varying from oblong to oblate, large to very large, yellowish green, sometimes with a few dull red stripes and a slight bloom; cavity shallow; stem short, fleshy; basin abrupt and fairly deep; slightly plaited; eye closed; core abaxile; flesh greenish white; Water Core and Bitter Pit.

"Kerry Pippin."—Upright, vigorous; fruit oblate, slightly conic, small to medium, yellowish-striped and mottled with dull red; cavity narrow; stem medium; basin wide, rather shallow; eye mostly closed; core axile; flesh yellowish-white, poor flavour. Ripe 30th January, 1908. Heavy crop, too small for market.

"Tuscaloosa."—Fairly spreading and vigorous; fruit conic, oblate ribbed, showing mostly at the eye; large yellowish green, with light grey dots and whitish bloom; cavity small, slightly russety; stem short; basin narrow, not deep; eye rather large, closed; core axile; flesh yellowish green. Attacked by Bitter Pit and Water Core.

"Isham Sweet."—Upright, vigorous. Fruit oblong, conic, very large, green, nearly covered with dull red and streaks of red; cavity wide and deep; stem medium; basin rather deep, open or partially closed; core axile; flesh yellowish, fair flavour; attacked by Bitter Pit; fair crop. Ripe from 12th February, 1908. Not mentioned by authorities.

"Grange's Pearmain."—Upright, vigorous. Fruit oblate, slightly ribbed; large, yellowish green, with small grey dots; cavity deep, wide, russety; stem rather short; basin deep; eye closed; core axile; flesh white; bad with Bitter Pit and Water Core, which prevented it ripening properly.

"Huon Pearmain."—Tree rather spreading, vigorous; fruit conic, sometimes oblate; large, yellowish green, partly covered with light red, showing light dots; cavity wide and deep; stem medium; basin rather narrow and deep; eye sometimes open; core axile; flesh yellowish; flavour good; heavy crop. Ripe from 10th February, 1908. A promising dessert apple.

"Kentish Fill-Basket."—Fairly spreading, vigorous. Fruit conic, oblate; very large; greenish yellow, and small light specks, with thin white bloom; cavity wide; stem medium to short; basin deep, plaited; eye closed; flesh greenish white, acid flavour; fair crop. Ripe 6th February, 1908. Large cooking.

"Peasgood's Nonsuch."—Fruit round, oblate, large; light green with red blush and stripes and light spots; cavity wide and rather deep; stem short; basin wide, eye open. Picked 28th February, 1908. Heavy crop. Suitable only for cooking.

"Trivett's Seedling."—Upright, vigorous; fruit oblong, small to medium; greenish, nearly covered with red and red stripes; cavity narrow, rather deep; basin fairly wide, abrupt, and rather deep; eye closed; core axile; flesh white, fair flavour; heavy crop. Ripe 5th February, 1908. A dessert apple, but rather small.

"Fall Beauty."—Fruit oblate, flattened at apex and base, very large; green with slight dull-red blush; cavity shallow and small, stem short, basin sometimes ribbed, eye partially open; core axile; flesh greenish white; flavour acid. A cooking apple. Not mentioned by authorities.

"Mrs. Fergusson."—Upright, rather stunted; fruit conic, very small, yellowish green, striped with red; cavity small, stem short, basin plaited, rather deep, eye closed; core axile; flesh woolly, white, flavour poor. Heavy crop. Worthless on account of small size.

"York Imperial."—Vigorous, fairly spreading; fruit oblate, conic, and ribbed towards the eye; large, greenish yellow, glossy; cavity wide, stem mostly short, basin deep, eye closed; core axile; flesh greenish white, flavour fair; bore few specimens only; cooking. Ripe 16th January, 1908. Soon went bad after picking.

"Nelson's Codlin."—Upright, fairly vigorous; fruit oblong, conic; small to medium; whitish yellow, glossy, skin smooth; cavity deep, russety; stem medium; basin narrow, rather deep; eye closed; core abaxile; flesh greenish white; rather acid, cooking; fair crop. Ripe 26th January, 1908.

"Cullender."—Spreading, stunted; fruit oblate, conic, very large, green, almost covered with dark red blush, and a few light dots; cavity wide, stem short, basin deep; eye partially open; core abaxile; flesh greenish white, tough, acid; a poor quality apple, only fit for cooking. Ripe 7th February, 1908. Not mentioned by authorities.

Pears.

"Clapp's Favorite."—Upright, rather stunted; fruit acute pyriform, large, yellowish green, with dull red blush and many brown dots; stem medium, set at an angle; basin shallow; eye partly open; flesh rather coarse, white; flavour fair; dessert or cooking. Ripe 8th February, 1908. Tree bore few specimens only.

"William's Bon Chrétien."—Upright, vigorous; fruit ovate pyriform, large; greenish yellow, turning to waxen yellow; when ripe, skin sometimes with a brown blush and many grey spots; surface uneven; basin plaited, shallow; eye partially closed; flesh melting; yellowish white, juicy; excellent flavour; dessert or cooking, evaporating. Ripe from 1st February, 1908. Heavy crop.

"Monchallard."—Fruit obliquely pyriform, rounded at stalk, large; greenish yellow, many greenish brown specks; stem in slight depression; basin shallow, wide; flesh coarse, white; poor flavor. Tree bore few specimens only.

"Howell."—Upright, stunted; fruit acute pyriform, turbinate, medium to large; yellowish green; stem medium, set at an angle; basin wide, shallow; eye open; flesh greenish white; fair crop. Picked 5th February, 1908.

"Chaumontel."—Upright, rather stunted; fruit long, obtuse, pyriform, large; yellowish, with many brown dots; stem rather long, set obliquely; basin very shallow; eye open; flesh coarse, white; flavour poor. Fair crop.

"Sheldon."—Upright, vigorous; fruit roundish, oblate obovate, large; green, with many brown specks; bore few specimens only. Picked 17th February, 1908.

"Fertility."—Stunted, upright; fruit obtuse pyriform, turbinate, small; yellowish green with many brown dots; stem short, set obliquely; basin shallow, eye open; flesh coarse, greenish white; fair crop. Ripe 4th February, 1908.

"Petite Margaret."—Tree very stunted; fruit roundish pyriform; small, yellowish green, uneven; stem about 1 inch long inserted in slight depression on one side; basin shallow, eye closed; bore few specimens only; ripe 5th February, 1908; not mentioned by authorities.

"Peach Pear."—Fruit obtuse, pyriform, turbinate, small; green turning to yellow with a mottling of russet spreading from the stalk; stem long;

basin shallow, plaited; eye open; flesh melting, juicy, white; flavour good; fair crop; a good dessert pear, but clashes with Bartlett, to which it is inferior. Ripe 8th February, 1908.

Plums.

"Hale."—Vigorous, fairly obliquely spreading; fruit roundish, medium to large; greenish yellow; stem slender; suture part way round; flesh greenish golden, juicy; flavour good; stone cling, medium. Ripe 14th January, 1908; light crop.

"Kelsey."—Tree vigorous, fairly obliquely spreading; fruit conic, ovate with obtuse point, medium to large; greenish, with light blue bloom; cavity rather deep; suture raised on one side, distinct half way; flesh greenish gold; very little flavour; stone cling, small. Ripe 21st February, 1908.

"Giant Prune."—Tree upright, vigorous; fruit oval and slightly necked; very large; purple with grey dots, turning a very deep purple when fully ripe; cavity slight; stem fairly long, suture distinct half way; flesh melting, juicy; greenish gold; flavour good; stone free, fairly large; bore few specimens only. Ripe 7th February, 1908. This variety has not proved good for drying.

"Fellemberg."—Rather stunted, spreading; fruit oval, oblate, slightly necked, large; dark purple with blue bloom and many brown spots and markings; hardly any cavity; stem medium; suture distinct half way; colour golden; flesh golden; flavour good; stone large, free; light crop; ripe 23rd February, 1908.

"Coe's Golden Drop."—Spreading, rather stunted; fruit oval, one side protrudes beyond other at apex, necked; large to very large; colour golden when ripe; light crop.

"Pond's Seedling."—Tree rather stunted, upright; fruit oval, slightly necked, large, red with a light bloom, cavity slight; stem fairly long; suture fairly deep half way; flesh rather dry; colour reddish gold; fair flavour, stone free, medium size; heavy crop; a handsome plum. Ripe 17th February, 1908.

"Kirke's."—Fairly spreading, vigorous; fruit roundish, oval, above medium; dark purple with a blue bloom; barely any cavity; stem medium, suture scarcely distinct; flesh greenish gold, very sweet; stone free, above medium size; very light crop. Ripe 12th February, 1908.

"Burbank,"—Fairly spreading, vigorous; fruit roundish, conical, with a distinct point; small to medium; green, covered with purple to a grey bloom; cavity fairly deep, stem slender; slightly raised on the side; flesh juicy, greenish; fair flavour; stone free, medium to small; heavy crop. Ripe 14th January, 1908.

"Bavay's Green Gage."—Fairly spreading, vigorous; fruit roundish oval, medium size, greenish yellow, with a light bloom and many light specks; cavity very slight; stem rather short; suture raised on one side, distinct half way; flesh greenish gold, very sweet; stone clings, rather small; fair crop. Ripe 25th February, 1908.

"De Montfort."—Spreading, vigorous; fruit roundish, medium; purple with brown specks and veins; cavity medium, stem fairly stout; suture distinct part way; flesh fairly firm, greenish gold; fair crop. Ripe 14th January, 1908.

"Prince Englebert."—Upright, fairly vigorous; fruit ovate, flattened on sides, medium to large; blue with light blue bloom and many grey specks; cavity shallow, stem medium; suture distinct half way; flesh dry, golden, acid; stone almost free, large. Ripe 2nd February, 1908. Heavy crop.

"Purple Gage."—Spreading, fairly vigorous; fruit roundish oval, slightly ovate; medium, purple with blue bloom, and many brown dots; cavity slight, stem long; suture sunken half way; flesh greenish, fair flavour; stone partial cling, small; fair crop: fruit rather too small for dessert.

"Belle de Septembre."—Tree upright, vigorous; fruit roundish, small, blue, almost black, with blue bloom; flesh, soft, watery, greenish golden; fair flavour. Ripe 7th January, 1908. Heavy crop.

"Yellow Egg."—Upright, thick, stocky wood; fruit oval, flattened on suture side; large, bright yellow with thin whitish bloom, and many light dots; cavity rather deep, stem medium, suture sunken half way; flesh yellowish; fair flavour: stone clings, rather large. Ripe 12th February, 1908. Light crop.

"Washington."—Vigorous, upright, thick wood; fruit oval, oblong, sometimes roundish, flattened on suture side; large, yellowish green, many light dots, thin light grey bloom; shallow cavity, short stem; suture distinct half way; flesh melting, juicy; greenish gold; stone almost free, rather small; light crop. Ripe 3rd February, 1908. Shows bruises very badly.

"Gold."—Upright, healthy, but small; fruit round, small; golden glossy; cavity fairly deep, stem medium; flesh juicy, greenish gold, fair flavour; fair crop. Ripe 30th January, 1908. An attractive plum of Japanese type, but too small to be of commercial value.

Glen Innes Orchard.

Apples.—Taking them as a whole, these trees continue to make satisfactory growth. The year a fine, sturdy lot of trees, very even in size, and they present a very attractive appearance, and are admired by all who see them. About 50 varieties blossomed last year, but only about a dozen carried fruit. Those which cropped the heaviest were the "Buncombe," followed by "Jonathan"; "Rome Beauty," "Cleopatra," "Five Crown," "Stone Pippin" and "Munroe's Favorite" carried some fruit, but did not crop nearly so heavily as the first-named two varieties, which two were also quite free from any disease, while most of the others suffered in a greater or less measure from Powdery Mildew.

Apricots.—These put on a very strong growth again, but the crop was frozen after it had set.

Cherries.—Some varieties are doing fairly well, but generally speaking the trees are not doing well in this orchard, and I fear they will not prove a success in this class of soil.

Peaches.—These also put on very heavy growth, and, like the apricot crop, the young fruit was completely destroyed by frost.

Pears.—These trees are doing fairly well, making satisfactory growth, and are a nice sturdy lot of trees.

Plums and Prunes.—Most of these trees are making satisfactory growth, but have not carried any fruit yet. The frost destroyed all the fruit on the early blossoming varieties last season.

Grapes.—A few of the American varieties have done exceedingly well, but some of them are not correctly named, and therefore I cannot mention the varieties until they have been identified. There is, however, a big demand by local residents for the cuttings, and we are unable to supply half of what are required.

Berries.—Only one red raspberry has proved of much value, but as this is not true to name I cannot give the correct designation until we have succeeded in identifying it.

Gooseberries and Currants have proved failures on the light soil.

Shelter Trees.—The Oriental Planes and Pinus Insignis have made very satisfactory growth, but the Walnuts are failures. The Cedrus Deodara are making fair growth, while the Osage Orange is doing well.

Grasshoppers.

Letters of complaints of damage done to crops, and appeals for advice, which annually reach the Department at the commencement of the grasshopper season, are now being received, and the repetition of the advice given by the Government Entomologist for the treatment of this plague will not be out of place at the present time.

Mr. Froggatt is of opinion that the most effective method is the spraying of the young hoppers with kerosene emulsion. One gallon of water should be boiled with a half pound of hard soap, to which should be added 2 gallons of kerosene. This should be thoroughly well mixed by pouring from one bucket to another. Water should then be added in the proportion of 6 gallons to every gallon of the mixture. This emulsion should be sprayed on when the grasshoppers are in the young stage, and preferably when massed closely together. When they reach the flying stage little can be done to deal with the pest.

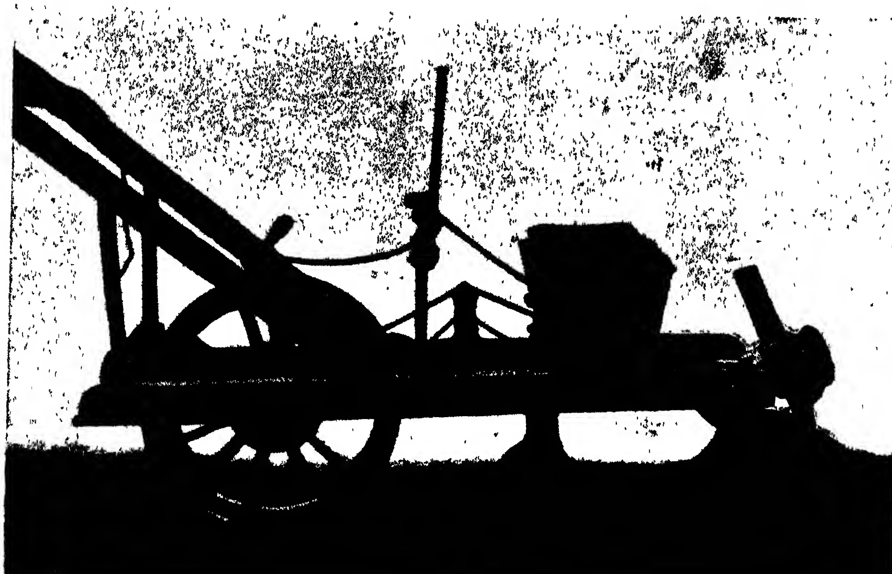
Useful Farm Implements.

A. H. HAYWOOD,
Grafton Experiment Farm.

Furrower for Corn-planter.

THIS attachment fitted on to the Farmers' Friend Corn-planter has reduced the cost of growing maize considerably on this farm. Its introduction has saved the cost and labour of one man and two horses during corn-planting operations.

The furrower is simply constructed by riveting two hillers or mould-boards off a Planet Jr. cultivator on to a standard (as shown in diagram).



Furrower attached to Corn-planter.

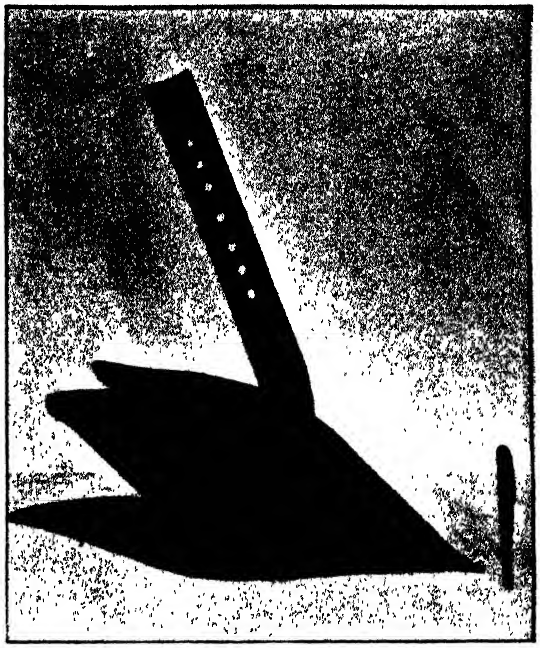
The furrower standard is bolted into the socket of the wheel standard (which is discarded).

A furrow is thus opened in advance of the seed-drill and can be regulated to any depth. With it the drill works steadier than with the wheel; the clods are thrown aside and a fine moist seed-bed prepared.

The scribe or marker is, of course, used in combination to mark out drills.

Potato Raiser.

There is nothing new about this, as it has been on the market for a long time, but it is doubtful if a cheaper device can be had for potato harvesting. It is specially recommended to the small grower.

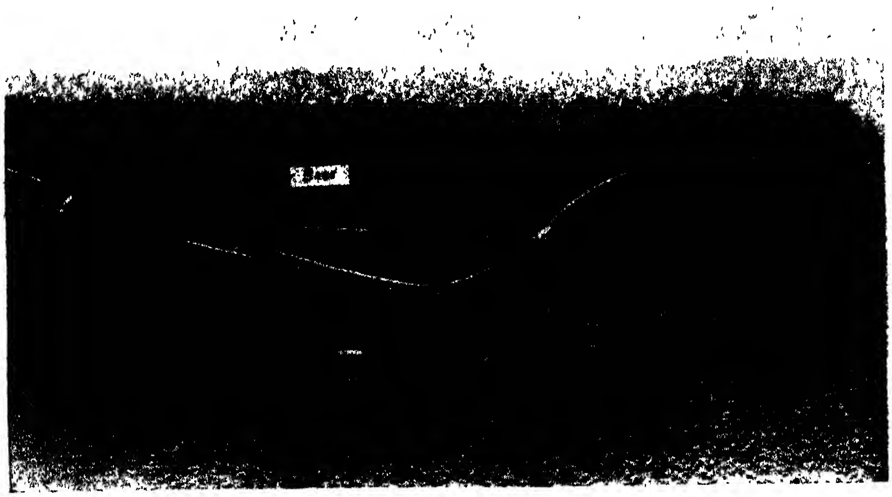


The Furrower.

It does not cut the tubers, and in clean ground does excellent work. One man with two horses can keep six men picking and bagging. It does equally well in raising sweet potatoes.

The raiser prongs can be fitted on to the ordinary Howard plough after the share and mould-board are removed.

The raiser attachment may be had from Messrs. Lassetter & Co., Sydney, at a cost of 17s. 6d.



A Potato Raiser.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 99. *Sporobolus pulchellus*, R.Br.

Botanical name.—*Sporobolus*, Greek, *sporos*, a seed, *bolos*, a throw with a casting-net, in allusion to the grains, which are on the outside of the panicle, as if they had fallen or been thrown out; *pulchellus*, Latin, pretty, the grass being ornamental when in flower. It is, indeed, one of the most beautiful of all grasses.

Botanical description (B.Fl. vii, 623):—

Stems tufted, 6 inches to 1 foot high.

Leaves chiefly at the base, flat or keeled, broad or narrow, rather rigid, bordered by rigid cilia tuberculate at the base. (Note the remarkable cilia. See Figure 5.)

Panicle loosely pyramidal, 2 to 5 inches long, with numerous capillary spreading branches verticillate at regular intervals.

Spikelets pedicellate, not ½ line long, shining.

Glumes almost hyaline, rather obtuse, slightly keeled, the second outer empty one and the flowering one nearly equal and similar, the lowest empty one about half as long, narrow but obtuse.

Palea very readily splitting in two.

Grain globular, enclosed in a loose hyaline pericarp.

Value as a Fodder.—A useful fodder plant, but little specific information as to its value is available.

Habitat and Range.—It extends from New South Wales to northern Australia. As regards New South Wales, it is found in the dry north-west.

The type came from northern Australia in the sense of somewhere between the Endeavour River and the Gulf of Carpentaria. No doubt "North Coast," *R. Brown*, and Endeavour River, *Banks and Solander*, as quoted by Bentham, are the co-types.

Bentham also quotes:—

North Australia.—Upper Victoria River, *F. Mueller;* Fort Darwin, *Schultz* No. 112; Escape Cliffs, *Hulse*.

Queensland.—Kennedy District, *Daintree;* Elliot River, *Bowman;* Peak Downs, *Slater*.

The National Herbarium, Sydney, contains co-types of this species collected by Banks and Solander and also by Robert Brown.

EXPLANATION OF PLATE.

1. Entire plant.
2. Branch of the panicle, greatly enlarged.
3. Single spikelet showing the glumes, the split palea and the ripe grain enclosed in the loose pericarp.
4. Glumes and grain of the single spikelet:
   - *a.* Outer glume.
   - *b.* Second glume.
   - *c.* Flowering glume.
   - *d.* Palea split into two.
   - *e.* Pericarp, grain taken out.
   - *f.* Grain without the pericarp. (Note its globular shape.)
5. Part of the leaf, much enlarged, showing the rigid marginal hairs (cilia).

DRAWN FOR THE "AGRICULTURAL GAZETTE."

SPOROBOLUS PULCHELLUS, R. Br.

The Composition of Green Maize and of the Silage produced therefrom.

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AND
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Rothamsted Experiment Station, late of the South Eastern Agricultural College, Wye.

Introduction.

The process of making silage is an ancient one,[1] and the scientific investigations date back at least to 1873, when Weiske,[2] at the Proskau experiment station, showed that there was a loss of carbohydrate, fibre, and protein in making silage from sainfoin and other crops. It was, however, by no means general till after the publication, in 1875, of Goffart's remarkable success with maize silage at Burtin, in the barren district of Sologne (Loire-et-Cher).[3] Both Grandeau[4] and Barral[5] analysed Goffart's silage; the former noted the production of volatile and non-volatile acids, and labelled them acetic and lactic acids respectively, in which practice he has been followed by most later analysts. Five years later Kellner[6] demonstrated by careful quantitative measurements that the decrease in protein was accompanied by an increase in the amount of "amide" nitrogen. In his experiments about 28 per cent. of the nitrogen was lost, but in a subsequent paper[7] this was traced to volatilisation of ammonia during manipulation of the sample. Kellner considered, and probably correctly, that no nitrogen is lost in the free state from the silo.

Much attention was given to the subject in the wet cycle of years ending in 1883: Fry's letters appeared in the *Agricultural Gazette* and *Mark Lane Express* for 1883 and 1884, and were reprinted in book form in 1885[8]; numerous papers, scientific and practical, were published in 1884 and 1885, and in the latter year a commission sat under Lord Walsingham to collect evidence and report thereon.[9] Experiments were also made at

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[1] See, *e.g.*, Johnston, *Trans. Highland and Agric. Soc.* 1843, new series, 9, 57. A good historical account is given by Jenkins, *Journ. Roy. Agric. Soc.* 1884, 20, 126.

[2] Quoted by Voelcker, *Journ. Roy. Agric. Soc.* 1884, 20.

[3] *Sur la culture et l'ensilage du Maïs-fourrage* (Memoire présenté à la Société centrale d'Agriculture de France, 1875). On p. 8 he says: "Lorsque j'ai acheté le domaine en 1840...huit malheureuses vaches et cent vingt brébis composaient tout le cheptel d'alors et vivaient misérablement...aujourd'hui le même domaine nourrit abondamment soixante-huit bêtes à cornes, six chevaux, et trois cents moutons." He had about 300 acres.

[4] *Ibid.* p. 39.

[5] p. 50 and Part 2, p. 24.

[6] *Land. Versuchs-Stat.* 1880, 26, 447. Mangold leaves were used.

[7] Kellner and Sowano, *Land. Versuchs-Stat.* 1889, 37, 16, also Kellner, *Chem. Zeit.* 1890, 14, 905.

[8] *Sweet Silage*, 1885, Agric. Press Co., London.

[9] The Evidence and Report contain interesting accounts of the methods of making silage, its place in the economy of the farm, and its value here and elsewhere.

Rothamsted.[1] The scientific papers were mainly analytical, and did little more than confirm the earlier results. Weiske and Schulze[2] made maize silage in barrels and observed an increase in the amount of ether extract; they supposed this was due to the conversion of sugar into lactic and butyric acids, both of which are soluble in ether. Analyses were published by Kinch,[3] Lloyd,[4] Richardson,[5] Smetham,[6] Voelcker,[7] and the late Dr. A. Voelcker,[8] and served to correct a number of misconceptions that had arisen. As silage never became general in England there have been only few papers published here since 1885.

Meanwhile the subject was being taken up in America. In most parts of the States maize is a far more popular crop than roots, and silage provides the stock with their succulent food in winter. A vast amount of work has been done at the different stations. It is only necessary to mention the investigations of Jordon[10] and Armsby[11] on the digestibility, which proved conclusively the loss of nutritive value; Woll,[12] Hills,[13] Collier[14] and King[15] on the loss of dry matter; King[15] on certain physical questions involved; and Babcock and Russell[16] on the bacteriological aspects of the question.

The composition of Green Maize.

For some years past it has been the practice at the Wye College to grow green maize as a fodder crop and make a certain quantity into silage. The original idea was to see if silage could to any extent take the place of roots, which, on the light chalky soil of the College farm, are often difficult and sometimes expensive to secure. It may at once be stated that green maize was found to be valuable, but silage was only economical in exceptional seasons.[17] The maize was cut during October as opportunity offered, chopped into pieces, and filled into the silo, a cylindrical wooden structure 12 feet in diameter and 17 feet high, standing in an extension of the barn. A large sample of the cut pieces (10 or 15 kilos) was drawn, a small subsample taken

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1 *Agric. Gazette*, 1885, also *Rothamsted Memoirs*, Vol. 4, No. 12.

2 *Journ. für Landwirtschaft*, 1883, 32, Heft. I. Abs. in *Journ. Chem. Soc. Abs.*, 1884, p. 1409. Cf. also Paladin, *Ber der Bot Gesellschaft*, 1888, 6, 205 and 296.

3 *Trans. Chem. Soc.* 1884, 45, 122.

4 *Chem. News*, 1884, 49, 210.

5 *Trans. Chem. Soc.* 1885, 47, 80.

6 *Journ. Roy Agric. Soc.*, 1884, 20, 380.

7 See *Report of Commission*.

8 *Journ. Roy. Agric. Soc.* 1884, 20, 482; other workers quoted in this paper are Moser and Holdefleiss.

9 *E.g.*—It was often supposed that fibre became digestible during the process, and some even considered that sugar was produced. Lawes, in his evidence before the commissioners, pointed out the fallacy of supposing that poor, coarse grass, weeds, etc., would change into useful, nutritious food in the silo.

10 *Maine Reports*, 1893 and 1894 (*Expt. Station Record*, 1895, 6, 746 and 1896, 7, 884).

11 *Pennsylvania Reports*, 1889 (*Expt. Station Record*, 1892, 3, 457).

12 *Land Versuchs-Stat.* 1889, 36, 161.

13 *Vermont Reports*, 1893 (*Expt. Station Record*, 1895, 6, 919.)

14 *New York State Reports*, 1892 (*Expt. Station Record*, 1895, 6, 65.)

15 *Wisconsin Report*, 1894 (*Expt. Station Record*, 1897, 8, 350 and 687 : 1898, 9, 393); also *Wisconsin Report*, 1900.

16 *Wisconsin Report*, 1900.

17 E. J. Russell, *Journ. Board of Agric.*, *April*, 1907, p. 14. Reference is also made to the feeding value of silage, which is not dealt with in the present paper.

for analysis, and the bulk weighed into a sack, sewn up, and thrown into the silo. This operation was repeated several times during the filling, so that at the end we had several sacks buried at different depths in the silo, each containing weighed quantities of maize of known composition.

The maize is green when cut and far from being ripe. Its composition depends very much on the season; in warm, dry summers there is about 20 per cent. of dry matter, while in cold, wet seasons only about 13 per cent. is found.[1] The difference falls almost entirely on the nitrogen-free extract, so that if the nitrogen-free extract and water are added together the sum is very fairly constant. The nitrogen, fibre and ash show only slight differences from year to year. Most of the nitrogen (about 80 per cent.) is present as true protein, not much amino acid or amide being present at the time of cutting. The nitrogen-free extract contains a certain amount of sugar, which appears to be mainly dextrose, but no starch. The juice is slightly acid to litmus paper, and contains gallic acid, but we could find neither lactic, malic, succinic, nor volatile fatty acids. Distillation with hydrochloric acid caused furfurol to be liberated from the pentosans.

TABLE 1.

AVERAGE percentage composition of green maize, end of September and early October.[2]

	Good Seasons.		Bad Season.	Intermediate Seasons.		Average of all.
	1901[3]	1905[4]	1903[5]	1904[6]	1906[7]	
Dry matter	21·90	18·70	13·35	15·00	15·09	16·81
Ether extract	·85	·52	·16	·66	·22	·48
Total nitrogen × 6·25	1·90	2·04	1·81	1·59	1·58	1·78
Nitrogen-free extract	13·60	9·88	6·70	8·06	8·39	9·33
Fibre	4·25	5·30	3·83	3·74	3·93	4·21
Ash	1·30	·98	·79	·95	·97	1·00
Total nitrogen	·304	·328	·289	·253	·252	·285
Protein nitrogen	...	·267	·210	·212	·166	·214
Non-protein nitrogen (by difference)	...	·061	·079	·041	·086	·071
% of total N. present as non-protein	...	18·8	27·3	16·2	34·1	25·0
Sugar	...	·98	1·5	·81	...	1·10
Furfurol obtained	...	2·48	2·01	1·83	1·92	2·06

The crop is never quite even; it is possible on the same day to pick out large, well-advanced plants, with hard, woody pith, growing alongside of smaller plants, less mature, with soft pith and much more juicy. The difference in composition lies mainly in the water content, the dry matter being much the same in both.

[1] The crop varies in the same way, and is much greater in warm than in cold seasons. The difference in the amount of good stuff per acre is therefore very considerable.

[2] For details of the methods employed see the Experimental Part, pp. 389 *et seq.*

[3] 1 sample. [4] 2 samples. [5] 2 samples. [6] 7 samples. [7] 1 sample.

TABLE 2.

PERCENTAGE composition of dry matter of (*a*) large, well-advanced and (*b*) small, less mature plants, cut the same day.

	Dry matter.	Ether extract.	Total nitrogen × 6·25.	Total nitrogen.	Protein nitrogen.	Nitrogen-free extract.	Fibre.	Ash.	Furfurol.	Sugar.
(*a*) Mature plants ...	18·95	3·24	10·75	1·72	1·52	55·58	25·01	5·42	11·97	5·74
(*b*) Immature plants ...	12·70	4·76	11·00	1·76	1·67	53·29	25·63	5·32	11·74	4·57

Composition of Silage.

Some months after filling the silo, the sacks were recovered and their contents weighed and examined. The silage had a brownish-green colour, but otherwise the pieces looked unaltered. It had a pungent smell suggesting butyric acid, and was acid to litmus. Numbers of bacteria were present, including *Bac. subtilis* and others, but there was no mould of any sort. The composition is curiously constant, showing far less fluctuation from year to year than does the original maize.

TABLE 3.

AVERAGE percentage composition of maize silage.

	1901.	1903.	1904.	1905.[1]	1906.	Average of all.
Dry matter	12·10	12·20	13·79	13·56	13·32	12·99
Ether extract[1]	·16	·10	·83	·56	·29	·39
Total nitrogen[1] × 6·25	1·32	1·35	1·65	1·69	1·30	1·45
Nitrogen-free extract	5·08	5·67	5·15	5·32	5·61	5·38
Fibre	4·66	4·13	5·06	5·06	5·20	4·82
Ash	·98	·95	1·10	·93	·92	·98
Total nitrogen	·213	·216	·265	·269	·208	·234
Protein nitrogen	...	·121	·156	·181	·089	·137
Non-protein nitrogen (by difference)	...	·095	·109	·088	·119	·103
% of total N. present as non-protein	...	43·8	41·1	32·8	57·2	43·72
Nitrogen as NH_3...	...	·003	·006	·014	·006	·007
Nitrogen as amide	...	...	·007	·010	·001	·006
Sugar	nil	nil	nil	nil	nil	nil
Furfurol obtained	...	2·00	1·87	2·26	...	2·04
Volatile acid (as H_2SO_4) ...	...	·17	·07	·03	...	·09
Non-volatile acid (as H_2SO_4) ...	..	·30	·68	...	...	·49

[1] The figures for total and non-protein nitrogen and ammonia are all somewhat too low because we have not been able to avoid loss of ammonia during sampling. We reduced loss as far as possible by starting the several nitrogen determinations in the wet silage immediately the sample was drawn. The ether extract figures are only approximate. See experimental part for details.

When silage is pressed it readily yields quantities of a brownish juice of very complex composition. The amount and nature of the nitrogen compounds in 100 c.c. of typical sample of this juice were as follows :—

Total nitrogen	·161	
Nitrogen as NH_3	·030=18·6	per cent. of total
Nitrogen as amide	·014= 8·7	,, ,,
Nitrogen as amino acid ...	·089=55·3	,, ,,
Nitrogen not accounted for ...	·028=17·4	,, ,,

A list of the more important compounds present in silage appears in the accompanying paper. It comprises a number of acids containing no nitrogen, which probably have no actual feeding value; among these are formic, acetic, butyric, caproic, and hexoic acids, two hydroxyacids, lactic and malic, and also succinic acid. There are also simple nitrogenous compounds, amino acids, basic diamino acids and amides, the feeding value of which is not yet settled, but is certainly less, and probably much less, than that of protein. Finally there are amines which are actually injurious, though whether they normally occur to a sufficient extent to do any harm may be doubted; cases have come to our notice, however, where animals have not thriven on silage, and the trouble may very probably be ascribed to these bodies.

It is common to speak of the large amount of "amides" present in silage, but Table 3 shows how very small the quantity really is. Amides occur to a smaller extent than ammonia, and to a still smaller extent than amino-acids. They form only about 5 per cent. of the non-protein nitrogen, and in view of this fact it is highly desirable that the practice of regarding all of the non-protein nitrogen compounds as amides should be discontinued.

The losses going on during ensilage.

On comparing the composition of silage with that of the maize from which it was formed it is possible to discover what has been the loss during the process. An exact quantitative comparison is rendered impossible by the difficulties of sampling and of preventing loss of ammonia, but it is quite clear that a considerable amount of dry matter has disappeared during the process. The loss is not uniform throughout the silo, and no two bags give exactly the same results, but the average of our experiments during 1905 and 1906, set out in Table 4, shows its general distribution.

It will be noticed that the fibre is practically unaltered in amount, and we have confirmed this observation by microscopically examining sections of maize and of the silage afterwards produced. We found that the epidermal cells had undergone no change in the silo beyond a certain amount of shrinkage; even the stomata were unaltered. Similarly the vascular bundles were intact.

The nitrogen-free extract suffers most. Direct tests showed that the sugar disappears almost entirely. The fall in the furfurol indicates a decrease in the amount of cellulose, *i.e.*, the less resistant cellulose, which alone falls into this group; this was confirmed by microscopic examination, which showed that many of the cells of the mesophyll were completely disintegrated.

The protein suffers considerably, though not in reality as much as the nitrogen-free extract. Hydrolytic decomposition, complicated by bacterial action, takes place, and although there is not much, if any, loss of free nitrogen, the new nitrogenous compounds are less valuable as food than the protein.

TABLE 4.

MEAN losses in the silo, 1904 and 1905.

	Dry matter.	Ether extract.	Nitrogen-free extract.	Fibre.	Total nitrogen.	Protein nitrogen.	Non-protein nitrogen.	Ash.	Furfurol.
Put in...	100	100	100	100	100	100	100	100	100
Brought out...	64	84	45	92	74	45	183	86	68
Loss ...	36	16	55	8	26	55	...	14	32
Gain ..	...	...	...	...	...	...	83	...	...

The figures show an absolute loss of nitrogen, but we are satisfied that a certain amount of ammonia is given off during sampling, and we have no evidence to show how or to what extent losses of nitrogen occur in the silo. In laboratory experiments on silage made in bottles we only observed losses of nitrogen when air was admitted, and this did not happen in the silo.

The figures given for the loss in ether extract are quite accidental, since the value obtained in any particular bag depends on its position in the silo; the bags in the *top* half showed a considerable loss—32 per cent. on the average—those in the *lower* half showed an average gain of 6 per cent. The ether extract of silage contains a number of soluble acids which obviously wash downwards. Further, since these acids are derived from the nitrogen-free extract or protein of the maize it follows that no comparison is in any case possible.

A similar downwash occurs with the soluble ash constituents, the upper bags losing on an average 17 per cent. and the lower bags gaining 2 per cent., hence the average figure given in Table 4 is of no value. The insoluble ash constituents are of course not liable to this movement; but their amount is so small and variable—depending partly on the presence of stray soil—that the experimental error becomes too large to give the calculations any value.

The general nature of the losses outlined above is probably the same in all silos, though the actual amount varies: our losses are higher than those observed by American investigators, but there is considerable difference between American and English maize at the time of cutting; ours is much less mature, and contains a lower proportion of nitrogen-free extract.

When a farmer makes silage on a large scale he often wants to know what loss takes place in his silo. The most convincing way of demonstrating this is, of course, to bury weighed bags of material as we have done, but a sufficiently accurate result can be obtained by assuming that the fibre undergoes no change, or only a 5 per cent. loss, and calculating on this basis the

amount of each constituent that should be present. This method is much better than another which is sometimes used—viz., to assume that the ash is unchanged in amount, and to use it as the basis of calculation; in the first instance, as we have just seen, the soluble ash is liable to wash downwards, and in the second place the percentage of ash is so small that a trifling error in sampling or determination very considerably affects the result. Of course there is in any case the difficulty of getting the average composition of the green material and the silage, which is only got over by taking a number of samples. In our experiments more than one-third of the total dry matter was lost, including more than half the nitrogen-free extract and the protein; in the latter case some of the decomposition products, the amino-acids, etc., remained in the silo, so that the actual loss of nitrogen was only 26 per cent. The fibre appeared to undergo no change.

Experimental details.

Analytical Methods.—The determinations of fat, total nitrogen, fibre, etc., were all made in the ordinary manner. Non-protein nitrogen was estimated by Stutzer's method, the substance is boiled with a mixture of copper hydrate and glycerine, which dissolves the non-protein but leaves the protein in the insoluble residue. The method is no doubt open to objection, because some proteins may dissolve and some insoluble non-protein bodies, *e.g.*, the purin bases, may remain insoluble. But when used for purposes of comparison, and not with an idea of getting absolute results, we consider that it gives quite valuable information.

To determine the quantities of nitrogen present as ammonia, amide, and amino-acid respectively, we adopted the very elegant methods used by Drs. Horace Brown and Millar, described in the *Transactions of the Guinness Research Laboratory*, Vol. I, Part 1, 1903. We have found them work very satisfactorily with our substances.

The furfurol obtained on distillation with hydrochloric acid was converted into its hydrazone and weighed. Krug's method of working was adopted, but we prefer not to attempt expressing our results in terms of any particular pentosan. It is well known that several groups of bodies give furfurol on distillation, including pentosans, celluloses (the so-called "oxy-celluloses"), glycuronic acid, etc., but that certain members of the groups yield instead non-volatile hydroxy-furfurols, and hence cannot be estimated in this way. In view of the fact that the furfurol yielding bodies of green maize have not been carefully examined, we prefer to give the experimental figure only, and in the Tables have given the actual weight of furfurol obtained from 100 parts of substance. No doubt the less resistant or "oxy-celluloses" are responsible for much of the furfurol.

Method of Procedure.—The maize was cut up, roughly dried at about 80° C., ground in a coffee mill, and reduced to a fine powder in the Maercker mill. Drying could now be completed, and samples taken for analysis.

A different scheme had to be adopted for silage. As the bags were recovered from the silo they were weighed, brought to the laboratory, and

samples taken as speedily as possible for the various nitrogen determinations. But no matter how quickly we worked we could not altogether avoid loss*; our figures for total nitrogen and free ammonia are therefore low. Still, the loss is much less than if the samples had been dried before the nitrogen was determined, for the nitrogen found in the dried material is always less than one expects by calculating from the amount in the original wet silage. It will be observed that in three cases the difference is approximately equal to the amount of ammonia present in wet silage, but in the other cases it is much greater

Samples 1 to 4 were drawn from the 1905 silage, sample 5 was taken in 1906, and sample 6 comes from a silo on another farm.

Another sample of silage was quickly drawn for the determination of the volatile acid. It was distilled in steam, and the distillate titrated with standard alkali. The results are only approximate, the higher acids come over so slowly that the distillate never really becomes neutral. The non-volatile acid was estimated by titrating the residue in the flask, but we soon gave up this determination because of the difficulty of getting a sharp end reaction.

TABLE 5.

PERCENTAGE of nitrogen in the dry matter of silage.

	Sample 1.	Sample 2.	Sample 3.	Sample 4.	Sample 5.	Sample 6.
Calculated	1·90	2·10	2·41	2·15	1·58	2·31
Found	1·42	1·61	1·19	1·24	1·45	1·70
Loss during drying	·48	·49	1·22	·91	·13	·61
Ammonia found in wet silage ...	·41	·36	·33	·94	·01	·07

A third sample was dried, ground, and used for the estimation of ether extract, fibre, ash, and nitrogen-free extract. The ether extract results are only approximate; samples continue losing weight for days in the extraction apparatus. Some of the acids are only slightly soluble in ether; the colouring matter also dissolves with difficulty.

The bulk of the sample was then used for qualitativeexamination.—(*Journal of Agricultural Science.*)

The Chemical Changes taking place during the Ensilage of Maize.

EDWARD J. RUSSELL, D.Sc. (Lond.),
Rothamsted Experiment Station.

When the green parts of living plants are cut up and packed in a loosely covered vessel allowing entrance of air, mould soon makes its appearance and decomposition begins; the mass becomes alkaline and is ultimately converted into black humic bodies quite unfit for cattle food. But if air is excluded the change is fundamentally different; no mould developes, the temperature rises, the mass takes on a greenish-brown colour and characteristic odour, it becomes acid, and for a long period is suitable for cattle food. The former is a putrefactive change, the latter gives rise to silage.

The general chemical changes known to take place during ensilage are the conversion of sugar and similar bodies into carbon dioxide and water, the production of volatile acetic and butyric acids and of non-volatile lactic acid, and the conversion of protein into non-protein[1] material.

Several hypotheses have been put forward to account for the silage changes, and to explain why the product keeps so long. According to one—perhaps the commonest—fermentations set up by micro-organisms evolve so much heat that everything is killed and the mass becomes sterilised. Another view is that certain thermophilous organisms bring about the observed changes.[2] Wollny[3] considered that the lactic and acetic acids were formed by bacteria, but that the rise of temperature was a respiration effect. On the other hand, Pasteur's work on anaerobic respiration led Fry[4] to conclude that the changes are not due to bacteria at all, but to the cell, and are the result of the altered conditions in which the cell now finds itself. In absence of air oxidation of sugar does not go as far as carbon dioxide and water, but stops at alcohol and acetic acid. This view has been developed by Babcock and H. L. Russell[5] in an important paper published in 1902; they found that silage could be made perfectly well in the presence of ether or chloroform, and they therefore conclude that bacterial activity cannot be an essential factor in the process. No acid was produced in this case, however; but acidity appeared when the cells were not killed, and the longer the cells lived the more acid was formed.

[1] Sometimes called "amides," but it is highly desirable that this term should be dropped. The word "amide" has a definite chemical significance, and many of the nitrogenous non-protein bodies in plants are not "amides" but amino-acids, etc.
[2] *E.g.*—Griffiths, *Chem. News*, 1894, 70, 273: see also Lafar, *Tech. Mycology*, p. 262.
[3] *Die Zersetzung der Organischen Stoffe*, 1897.
[4] *Sweet Silage*, 1885, Agric. Press Co., London.
[5] *Centr. für Bakt.* 1902, 9, 81.

The first of these hypotheses may be dismissed at once, since silage invariably contains bacteria and is never sterile. Bacteria must, therefore, obviously play some part, even if only a secondary part, in the process. It is equally clear that the living cell is an active agent. Silage is always made from living plants, and the cells live for some time after they are put into the silo; the breaking down processes can still go on, though they may be modified by the absence of air, but the building-up processes depending on light and air are stopped. Three sets of agents—the living protoplasm, enzymes and bacteria—appear to be involved, and no hypothesis is satisfactory which fails to take account of all three.

The green maize and the silage dealt with in the present paper were produced at the Wye Agricultural College, where a large part of the experimental work was done. The method of making the silage is described in the preceding paper; the details of the separation and the analytical results are in the experimental part of the present one.

The substances produced during ensilage.

On comparing the weights of the various groups of constituents of green maize put into the silo with those of the silage brought out, it is found (see article, "The Composition of Green Maize," &c.) that (1) there has been practically no change in the fibre; (2) all of the sugar and some of the less resistant celluloses disappear; (3) carbonic acid is evolved and a number of acids appear, which were not before present; (4) the "protein" nitrogen compounds, *i.e.*, those forming insoluble compounds with copper hydrate, are reduced to about one-half; (5) the non-protein nitrogen compounds, *i.e.*, those forming soluble copper compounds, practically double in amount.

The changes undergone by the nitrogenous compounds are well seen in the juices pressed out from maize and from silage respectively; the latter contains more substances reacting with nitrous acid and with phosphotungstic acid than the former.

	Weights in 100 c.c. of juice.		Relative weights, total N. = 100.	
	Fresh maize juice, grams	Silage juice, grams.	Fresh maize juice.	Silage juice.
Total nitrogen	·0677	·161	100	100
N. liberated by H.N.O.$_2$[1] ...	·0183	·089	27	55
N. precipitated by phosphotungstic acid	·0108	·060	16	37

The relative amounts of the different groups of nitrogen compounds in silage vary somewhat, but the juice referred to in the preceding table contained in 100 c.c.:—

	Grams.	Percentage, total=100.
Nitrogen as ammonia	·030	18·6
Nitrogen as amide...	·014	8·7
Nitrogen as amino-acid	·075	46·5
Nitrogen not accounted for ..	·042	26·2
Total	·161	100

[1] In the apparatus designed by Drs. Brown and Millar (*Trans. Guinness Research Lab.* 1903, 1, 30).

These results indicate the general nature of the changes; we can, however, get more definite information by ascertaining what compounds are actually present. The following have been isolated by the author from silage:—

Alcohols.	*Fatty acids.*	*Hydroxy-acids.*	*Dibasic acids.*
Ethyl. alcohol	Formic acid	Lactic acid	Carbonic acid
	Acetic acid	Malic acid	Succinic acid
	n-Butyric acid		
	Isopropylacetic acid		
	Hexoic acid (*either* *n*-caproic *or* isobutylacetic acid)		

Nitrogen compounds.

Mono-amino acids.	*Diamino acids.*	*Basic compounds.*
A mixture which could not be separated. Reactions indicate	Histidine	Ammonia
glycocol	Lysin	Pentamethylene diamine
alanine and others	Ornithin	Betain (trace only)
		Adenin
		Another purin base not identified

In addition there was some gummy matter, some lecithin, a fragrant oil, a little humus, besides the usual celluloses, protein, oil, etc.

The following were sought for, but could not be found:—Aldehyde, higher alcohols, glycerin, arginin.

Many of these are altogether absent from maize, *e.g.*, the volatile acids, lactic acid, etc.; others are found, *e.g.*, the amino acids, but to a much less extent.

This list does not include all the constituents, for indications of other bodies were obtained; but it will be found sufficient to give a fairly accurate idea of what goes on in the silo.

The agents producing the changes.

It has already been stated that there are three possible agents likely to be involved in bringing about changes in the silo, viz., living protoplasm carrying on its vital functions, particularly respiration, enzymes which, though originating from protoplasm, can, nevertheless, act independently of it, and micro-organisms. The relative parts played by these three cannot be ascertained by direct experiment because of the impossibility of sterilising pieces of living maize; hence the effect of the cell alone, apart from organisms, cannot be investigated. The method adopted in the first series of experiments was to pack into bottles (which make very good miniature silos) pieces of (A) living maize, to get the total effect of all three agents, (B) maize killed and sterilised with toluene, which still allows enzymes to act, (C) maize killed by heating to 98° C., when enzymes and living organisms are destroyed, but not spores; certain organisms may, therefore, develop, (D) living maize inoculated with silage juice containing large numbers of the organisms actually occurring in the silo. In all these cases the bottles were closed to prevent entrance of air, but provision was made for the escape of gases. Further, in order to observe the effect of admitting air, some of the bottles containing living maize were simply plugged with cotton-wool (E). The bottles were then kept for five months at 20° C. in an incubator. At the

end of the period the bottles were opened and the contents examined. The results may be summarised as follow :—

Air excluded.				Air admitted.
A	B	C	D	E
Protoplasm, enzymes and casual organisms all acting. (Living maize).	Enzymes only acting. (Maize and toluene.)	Protoplasm and enzymes killed : spore-forming organisms present. (Maize heated to 98° C.)	Protoplasm, enzymes and silage organisms present. (Maize and silage juice.)	(Living maize).
Silage formed.	No obvious change.	No obvious change.	Silage formed.	Putrefaction.
No mould.	No mould.	Little mould.	No mould.	Much mould.
Some dry matter lost (25%).	No loss.	Little loss (12%).	Some loss (25%).	Much loss (60%).
Mass becomes acid.	No change.	No change.	Mass becomes acid.	Mass becomes alkaline.
Volatile acids (acetic and butyric) formed.	None formed.	None formed.	Acetic and butyric acids produced	None formed.
Protein changes to non-protein.	Protein changes to non-protein.	No change.	Protein changes to non-protein.	Non-protein changes to protein.
No loss of nitrogen.	No loss of nitrogen.	No loss of nitrogen.	No loss of nitrogen.	Nytrogen lost.

It will be observed that the characteristic silage changes; the production of the silage odour and colour, of volatile acids, and the conversion of protein to non-protein, occur only in A and D, where living cells are kept out of contact with air. If cells and organisms are killed, but enzymes are allowed to act, only one of the changes takes place—the conversion of protein to non-protein. If spore-forming organisms alone survive, as in C, none of the silage changes occur.

The Volatile Acids.—Since these are formed only in A and D, and not at all in B or C, their formation must be attributed either to the living protoplasm of the maize cell or to casual organisms; their invariable and rapid production in A (this experiment was repeated a number of times) appears strongly to indicate that they are formed by the living cell. Further, their non-occurrence in E shows that they arise only when the living cell is deprived of oxygen. They may, therefore, be regarded as products of anaerobic respiration. But, although the living cell is probably the primary agent, the organisms also play a part in either producing or modifying them; the acids in D, where organisms were introduced, were somewhat different in character from those in A. Complete separations were not attempted, but the silver salts of the mixtures contained the following percentages of silver :—

Mixture in A (living maize only).		Mixture in D (living maize + silage organisms).
Bottle 1...	56·56	60·21
Bottle 2...	57·52	

Silver acetate contains 64·65 per cent. and silver butyrate 55·40 per cent.

It appears that more of the lower homologues are present in D than in A.

The mixture found in the silo consists mainly of butyric and acetic acids, but there occur also formic acid and some of the higher acids. Formic acid and the higher acids are known to be the products of the bacterial decomposition of cellulose, and as cellulose disappears during ensilage one can safely attribute part of the volatile acid to organisms. These decompositions are, however, quite secondary.

The conversion of protein to non-protein.—Unlike the formation of volatile acids, the decomposition of protein does not depend directly on the living cell, for we find it going on in B, where the cells had been killed by toluene. It does not, however, occur in C, where the enzymes had been decomposed, and this change is therefore to be attributed to enzymes, which can act not only during the life but also after the death of the cell. The amount of change observed was—

	A (maize only).	B (maize and toluene).
Protein N. put in	100	100
Protein N. brought out...	75	89
Protein N. converted into non-protein.	25	11

The quantity of protein decomposed is less when the cells are suddenly killed by toluene than when they continue living for some time, but this is quite consistent with the general facts of enzyme action. The killed cells contain only the amount of enzyme present at the moment of death; action must therefore stop as soon as this has acted on the protein in its immediate vicinity; moreover, the toluene may retard its action. In A, on the other hand, fresh quantities of enzyme can always be made so long as the cell lives, and the presence of a little acid is known to be favourable to protein hydrolysis.

Further evidence of the presence of enzymes capable of decomposing protein was obtained by studying the changes in sterilized maize juice. Some green maize was cut in October, at the time the silo was being filled. It was pressed, and the juice, to which 2 per cent. of toluene was added, was kept at 25° C; after some time it was found to have undergone a considerable amount of hydrolysis, for there was a great increase in the compounds decomposed by nitrous acid and in those precipitated by phosphotungstic acid. Action has been more vigorous than in the last experiment, probably because diffusion has gone on better.

	In fresh maize juice.	After being kept at 25°.
Total N.	100	100
N. liberated by nitrous acid...	27	55
N. in phosphotungstic acid precipitate ...	16	33

As 2 per cent. of toluene was found to keep the juice sterile (for no growth was obtained on inoculating a little into bouillon), this hydrolysis can only

be attributed to enzymes. It is therefore evident that the maize put into the silo contained enzymes capable of hydrolysing the protein of the cell even after the cell is dead.

The change that has gone on in the silo clearly indicates that such a hydrolysis has actually taken place, and is to be regarded as the primary cause of the decomposition of protein during ensilage. In the first place, the average general grouping of the nitrogen compounds in silage (see p. 1021) is much the same as that in the hydrolysed maize juice just referred to; nitrous acid liberated 55[1] per cent. of the total nitrogen in each case, and phosphotungstic acid precipitated 37 and 33 per cent. respectively. In the second place, typical products of proteolysis occur in the silo. When protein is hydrolysed by tryptic enzymes the products include mono- and di-amino acids (lysin, histidin, &c.). When nucleo-proteins are hydrolysed the purin bases are obtained in addition. All these compounds are found in silage.

It would not, however, be correct to ascribe the whole change to enzymes. The organisms present are not without action on the nitrogen compounds, and certain bodies—*e.g.*, amines characteristic of bacterial action—are found in the silo. But the bacterial changes appear to be secondary, and not an essential part of the process.

The Influence of Free Oxygen on the Process.—The effect of allowing free oxygen to have access to the maize in E (see p. 1022) was to alter the product completely. There was a great development of Penicillium, which did not appear when air was excluded. The mass became black and had a musty smell; it was alkaline and appeared to be free from acetates and butyrates; there had been an increase in the amount of protein, indicating that some had been formed from the simpler non-protein material, presumably by the mould. The general changes were:—

	Dry matter.	Protein nitrogen.	Non-protein nitrogen.	Total nitrogen.
Put in ...	17·95	·197	·104	·301
Brought out ..	7·00	·238	·041	·279
Loss	10·95	—·041	·063	·022
Percentage loss ...	61·0	...	61·5	7·3
,, gain...	...	20·8	...	...

It will be remembered that in A and B, where air was excluded, the protein had decreased 25 and 11 per cent. respectively, whilst here it has increased 21 per cent.

The change in the non-protein substances was also shown directly by determining the amount of nitrogen liberated by nitrous acid. In the case of good silage juice, more than 40 per cent. of the total nitrogen is set free by this reagent; while only 7 per cent. is liberated from juice expressed from the black, alkaline, mouldy layers found at the top of the silo, stretching

[1] 55 per cent. was the mean amount obtained from silage juice; the actual amount, however, varied considerably in different samples from 38 per cent. to about 65 per cent.

down as far as the air can enter. Again, some fresh silage juice, which gave up 38 per cent. of its nitrogen on treatment with nitrous acid, was allowed to become mouldy; after three months only 18 per cent. was set free.

The disappearance of non-protein, and the formation of protein, indicates that the moulds and other organisms have utilised the simpler substances as food, and built them up into complex cell constituents. A similar change is known to take place when farmyard manure is stored.

The chemical effects following on the admission of air can be ascribed to the course of respiration in the cell, which now remains normal, so that butyric and acetic acids are no longer formed in quantity, and to the development of mould, which appears in the black, decomposed layers at the top of the silo as far as oxygen can get in, but not lower down. Indeed, the absence of mould is characteristic of good silage, though it is very difficult to explain. Penicillium is reckoned among the hardiest forms of life. It seems able to grow almost anywhere, and to tolerate bodies that would be fatal to most other organisms, yet it cannot grow in the silo, and at a certain distance down it stops absolutely short. On the dividing line, where the black, mouldy layer ends and the good silage begins, the author has often found pieces of maize 1 inch long, one end of which was strongly acid and free from mould, while the other was alkaline and had a growth of Penicillium. It would appear that there is some actual inhibiting agent produced in the silo when oxygen is absent and not formed when oxygen is present, though no doubt the absence of free oxygen in the silo is also a cause why mould does not develop.

The Course of the Process in the Silo.

Putting together our results, it is possible to sketch out fairly completely what happens in the silo. When the cells are put in they are alive and their vital functions continue. Respiration goes on and sugar, &c., is used up, but in absence of air oxidation is not complete, and intermediate bodies—alcohol, acetic acid, butyric and other acids—are formed, in addition to carbon dioxide and water. The tryptic enzymes of the cell act on the protein forming the usual hydrolytic products—amino acids, diamino acids, &c.; from the nucleo-proteins purin bases are produced in addition. The heat developed during these processes cannot be dissipated, as it usually is in the living plant by the evaporation of water, because water vapour cannot escape from the silo; instead, it raises the temperature of the mass. Respiration is accelerated by the increased temperature, but, as no more material is being elaborated, and only decomposition is taking place, the process soon comes to an end. The cell then dies for want of more substance to break down; it loses its turgidity and becomes flaccid, causing the mass to settle down. The temperature also steadily falls.[1] The decomposition of the protein, which had also been accelerated by the rise in temperature, can continue even after the cell is dead, because the enzymes when once formed

[1] The maximum of 33° to 37° C. (91·4° to 98·6° Fahr.) observed in the Wye silo was always reached in about five days; there was then a slow but regular fall.

are not dependent on the life of the cell—in other words, it is an autolytic decomposition. Some of the products formed in the above changes inhibit the development of mould, and the general conditions obtaining in the silo are unfavourable to putrefaction. The mass therefore remains good for food for a long time.

It is, however, not sterile. Certain bacteria are always present and attack the softer celluloses (but not to any extent the resistant "fibre") producing the humus, some of the fatty acids, and probably the succinic acid present in silage. They also carry several stages further the decomposition of certain of the nitrogen compounds, and produce those bodies which cannot be supposed to arise from tryptic hydrolysis of protein. Thus pentamethylene diamine is a well-known decomposition product of lysin; ornithin is known to arise from arginin, and the absence of the latter body may be due to its decomposition into ornithin and urea, which would further change into ammonium carbonate.

In the following scheme are set out the changes as the author supposes them to take place. The lactic and malic acids might have arisen from the amino acids or from the carbohydrate material; the present experiments do not enable one to decide this point.

On the above hypothesis the changes essential to the production of silage—the disappearance of sugar, the formation of volatile fatty acids, and the hydrolysis of protein—are all considered to be the result of the activity of the living protoplasm or of the enzymes of the maize cell. The other changes, due to the bacteria invariably present, are considered to be of purely secondary importance, and merely have the effect of complicating the product without greatly altering its nature or even masking the primary changes.—(*Journal of Agricultural Science*).

"Wonder Wheat": An American Wheat Story.

PARAGRAPHS have been in circulation in the Press recently concerning wonderful returns from wheat grown in Alaska. It was asserted that the Alaska wheat will yield 200 bushels to the acre, and conjectures have been made of the results when the wheat-producing countries of the world are sown with this fabulous grain. Many inquiries have been made of the Department of Agriculture respecting it, and it is possible that efforts may be made to sell small quantities of this, or a similar alleged wheat, at exorbitant prices. The Departmental Wheat Experimentalist states that the variety referred to is the well known "Miracle" or "Mummy" wheat, which belong to a group of wheats known as Poulard, Turgid, or Rivet Wheats (botanical name of which is *Triticum turgidum*), to which also belong the better-known Australian Poulard, and Galland's Hybrid. Many of this family have the habit of producing compound or divided ears, and because of this habit they are called Miracle, or wonderful wheats; so that the name Miracle is not confined to one variety, but is given to any variety of this class having divided or branching ears; this habit of producing compound ears is likely to lead the person not familiar with these varieties to believe that extraordinary yields would be obtained from them, but they are by no means prolific, and only yield in a very moderate manner.

Their value for milling is low, the flour being rich in starch, and poor in gluten, dark and unsuitable for bread-making, except when mixed with much "stronger" flour.

This group of wheats is by no means new to Australia. Under the names of Young's Bearded, Hen and Chickens, Mummy, Miracle, and Egyptian, different varieties have been growing in this country since the early days of wheat-growing.

Some of these varieties are rust-resisting; one of them under the general name Egyptian, because of its rust-resisting character, was fairly generally grown on the east coast, just after the prevalence of rust made the cultivation of common bread-wheats impossible in those districts.

PERSONAL: MR. F. G. CHOMLEY.

READERS of the *Gazette*, whilst regretting that Mr. Chomley is severing his connection with the *Agricultural Gazette*, will be pleased to learn of his promotion to the position of Manager of the Experiment Farm at Yanco. Mr. Chomley has acted in the capacity of Sub-editor of the *Gazette* for nearly four years.

The American Apple Industry

G. BRADSHAW.

THE late immense arrivals of American apples have been responsible for a good deal of notice in the daily papers, mostly reflective on the grounds that we can grow every variety of apple in this country, and did the Sydney cold store warehousemen only cater for this trade there would be small need for the thousands of pounds worth of Californians. In relation to the American apple crop, the Agricultural Department of the United States estimates that the average throughout the entire country will be about 58 per cent. of a full crop, as compared with 44 per cent. of a full crop for the previous year. The great centres of the apple industry in America are in New York State, Missouri, Illinois, Colorado, and the Pacific coast. In these widely scattered regions the apples are brought to the centres of distribution and consumption, and what is not sold or shipped at the time of harvest is placed in cold storage for use until another crop comes in. This State, which is credited with being the pioneer of refrigeration, is slow to realise the possibilities of cold applied to products other than meat, for even before our orchards are harvested, negotiations are opened with other countries for supplies to keep us going until our next crop is ready.

Appended are the wholesale prices realised in the Sydney markets for this season's first arrivals.

Apples—American.

	per bushel case. s. s.		per bushel case. s. s.
Canada Reds ...	12 to 15	Spitzenburg ...	14 to 15
Red Permains ...	12 ,, 15	Delaware Reds	13
Mo Pippins ...	12 ,, 15	Hoovers ...	13
Jonathans ...	12 ,, 15	Commerce ...	13
Winesaps ...	12 ,, 15	Baldwins ...	13

The first apple shipment to England the present season from America, was put on the Covent Garden market at the end of September, Baldwins fetching but 10s. per barrel (containing about 2½ bushels) as against 13s. for a bushel of the same variety here.

Another Bad Weed for New South Wales.

J. H. MAIDEN.

Scolymus maculatus, L., the "SPOTTED GOLDEN THISTLE."

Botanical Description.—An annual large herb with slender roots and much branched stems, especially at the base.

Stems slightly villous, winged nearly to the base with the broad decurrent bases of the leaves.

Leaves alternate, stiff, lanceolate in outline, green and shiny, variegated with white spots and margins, crowded at the base, but becoming gradually more distant and shorter on the stem, sinuate-lobed, with thickened margins and irregular strong and sharp marginal prickles.

Flower-heads solitary and terminal on the stalks, enclosed in leafy bracts longer than the flowers, and in a few rows of pungent-pointed involucral bracts.

Flowers golden yellow, all uniformly ligulate.

Receptacle conical, scaly, the chaffy scales partly enclosing the achenes.

Achenes without any pappus.

It is closely allied to *Kentrophyllum lanatum* (*Carthamus lanatus*), from which it is chiefly distinguished by the winged stems and branches. It may be looked upon, by non-botanists, as a coarse edition of that plant, which is figured in the *Gazette* for May, 1894, p. 298.

Occurrence in Europe.—A long description of the plant is given in Miller and Martyn's "Gardeners' and Botanists' Dictionary," but this is a description of the appearance of the plants, without economic notes. The only note of interest in this Dictionary is that Johnson says: "I saw this plant in this year (1633) growing in the garden of Mr. John Tradescant, sen., at South Lambeth, London."

This shows that the plant was already cultivated in England in 1633.

In W. Miller's "Dictionary of English Names of Plants" it is called "Spotted Golden Thistle." In the "Gardeners' and Botanists' Dictionary" it is called "Annual Golden Thistle."

It was evidently cultivated only for its beauty, but not for any economic value. Indeed, I cannot find any redeeming feature except its picturesqueness.

It is a native of the Mediterranean region. It has not been hitherto recorded as a naturalised plant in any of the Australian States so far as I am aware. It may originally have been a garden escape.

Occurrence in New South Wales.—"This thistle has been known to me for the last fourteen years or more in the neighbourhood of the cattle track, which is on the main stock route through Warrah, from Breeza to Sydney, *viâ* Merriwa. I have never seen it anywhere else. We, of course, destroy it and prevent an abundant growth; otherwise I feel sure it would soon take possession. Nothing will either eat it or approach it; it is, in fact, the most worthless and most dangerous plant I have ever met with belonging to the thistle family."—(George Fairbairn, Australian Agricultural Co., Warrah, Willow Tree.)

Mr. Ogden, manager of West Warrah, knew of the plant for several years prior to the 1902 drought.

Mr. Windeyer Thompson says it occurs at Miller's Creek, under the Liverpool Range (property of Messrs. Reid Bros.); Walhallow, on the Mucki River, Quirindi, and that it is said to have been in the district for sixteen or seventeen years.

The Warrah Shire Council, Murrurundi, are taking steps to proclaim it noxious.

The only way to exterminate it is to eradicate it not later than the flowering stage. If it be allowed to seed it will get a still firmer hold, and from Mr. Fairbairn's testimony it is a most dangerous weed.

The allied *Scolymus hispanicus* is a native of countries at or near the Mediterranean Sea. The young roots and tender shoots of this biennial herb serve as a culinary vegetable, much like salsify; the aged root acts as a diuretic. It is known as "Scolyme d'Espagne," or "Cardillo," or "Tagarninas" by the French; "Cardouille," near Montpellier (France). It has largely gone out of cultivation in France, but a full account of it will be found in "Le Potager d'un Curieux" (Pallieux and Blois).

THRIPS.

W. W. FROGGATT.

IN a letter to the Department of Agriculture, a correspondent states that hundreds of apple-trees in the Marsfield district—full of bloom—had not set a single apple owing to the prevalence of thrips. The apple most affected was "Granny Smith."

The question of thrips in the flowers of different fruit trees is a very interesting one. It is stated that in certain districts around Sydney the flowers of the trees, from no apparent cause, do not set; and though the tree may be covered with bloom, not a single fruit sets through some fault in the fertilisation.

It is a well-known fact that several species of "black fly" (*Thrypidæ*) feed upon the pollen of the flowers they infest, and the question is asked as to whether these tiny insects swarming in the opening flowers eat all the pollen, so that none comes in contact with the stigma, and the whole flower withers and drops off without maturing into a fruit. It seems hardly likely that all the pollen would be destroyed; we would rather expect to find that cross fertilisation would be caused by the presence of multitudes of these insects. They might, however, attack the stigma above the ovaries; and if they sucked the surface off, it would not be able to receive and assimilate the pollen that should fall upon its sticky surface. The flowers submitted by the correspondent, though being a second bloom, were full of small thrips in all stages of development, which is apparently the same species that attacks the rose in our suburban gardens.

The thrips propagate by means of eggs laid in clusters, probably upon the back of the twigs of the apple-tree. Spraying in winter before the buds open, with a caustic spray, such as lime and sulphur, would be probably one of the best methods of clearing them off the trees before they could get into the flowers.

The English Royal Horticultural Society's Examinations in Horticulture.

THE Minister of Agriculture has received advice from the Agent-General for New South Wales in London to the effect that, on the invitation of the Government of the United Provinces of India, the General Examination of the Society in the Principles of Horticulture is to be modified so as to fulfil the local requirements, and a first examination will be held in April, 1909, at Saharanpur. This has suggested the possibility of other countries and districts considering it desirable to enter candidates for a similarly modified examination, in which case the Council would doubtless be prepared to organise it.

The examiners are leading horticulturists in England, and for examinations abroad, will be assisted by suitable experts acquainted with the special horticultural conditions of the various countries desiring to adopt the English tests.

The General Examination is now an acknowledged standard of qualification in Horticulture in Great Britain, and it is thought it may be of similar advantage and assistance in New South Wales. Other details arranged will be communicated on application for the examination, but the following prospectus as arranged for 1909 will indicate its general lines and the sort of knowledge required.

If it should be considered desirable to adopt this proposal locally, the Department of Agriculture will be willing to communicate with the English Society, which would also greatly value the suggestion of the name and address of a competent person in Great Britain versed in the horticultural conditions of this country, who could be asked to co-operate with the examiners appointed by the Society.

The following is a prospectus of the examination :—

ROYAL HORTICULTURAL SOCIETY.

GENERAL EXAMINATION.

Candidates must be 18 years of age or over 18.

Elementary Principles

On which horticultural practice is based.

1. Soils, good and bad : their mineral composition, chemical nature of fertilisers and their respective values.
2. The physiological values of water, heat, and air in plant growth.
3. The structure of seeds and their modes of germination ; the chemical pheuomena of germination ; the movements of seedlings and the uses of them.
4. The functions of roots, their anatomical structure ; hindrances to healthy root action and their remedies.

5. The uses of stems and branches; the anatomical structure of ordinary dicotyledonous and of a monocotyledonous stem.
6. The physiological functions of leaves, and the action of light upon them.
7. The structure of tubers and other subterranean stems; the structure of bulbs and buds; the general phenomena of vegetative multiplication.
8. The physiological processes undergone in growth and development; the structure of an active cell, and the process of cell division and the formation of tissues.
9. The structure of flower buds and of flowers; the methods of pollination, natural and artificial.
10. The process of impregnation of the ovule, and the formation of the embryo and endosperm.
11. The classification and description of fruits; the changes and development during ripening.
12. The general characters of the commoner families of plants in cultivation.
13. The origin of species.

Horticultural Operations and Practice.

1. Surveying and landscape gardening; elements of.
2. Choice of site for garden.
3. Description and use of implements under each head.
4. Operations connected with the cultivation of the land, with explanations and illustrations of good and bad methods; digging and trenching, draining, hoeing, stirring the soil and weeding, watering, preparation of seed beds, rolling and raking, sowing, transplanting and thinning, potting, planting, aspects, positions and shelter, staking, earthing and blanching, etc.
5. Propagation, elementary principles; cuttings, buddings, and grafting, stocks used, layering, division, branch pruning, root pruning, old and young trees and bushes, training.
6. Fruit culture: Open air and under glass, small fruits, apples and pears, stone fruits; gathering and storing, packing, marketing, selection of varieties, etc.
7. Vegetable culture: Open air and under glass. Tubers and roots, green vegetables, fruits and seeds, rotation of crops and selection of varieties.
8. Flower culture: Outside and under glass.
9. Manures and their application.
10. Improvement of plants by cross-breeding, hybridisation and selection.
11. Arboriculture: Trees and shrubs and their culture.
12. Insect and fungus pests: Prevention and treatment.

A Liquid Manure for Tomatoes.

1. Two parts nitrate of soda, one part dried blood, four parts superphosphate of lime, and three parts kainit.

2. One-half part nitrate of soda, one part guano, and one part superphosphate.

Sulphate of ammonia can be used in lieu of the nitrate of soda and dried blood in the first-mentioned mixture.

Apply 1 oz. to a gallon of water once a week as soon as the first fruit has set and begins to swell.

The Preservative Action of Boric Acid in Butter.

Some months ago the Minister of Agriculture approved of the Dairy Expert undertaking a series of experiments to determine the best quantity of boric acid to add to butter for preservative purposes, without injuring the flavour or other qualities. Varying percentages of boric acid, from nil to 0·50 per cent., were to be added to butter, which was then to be put in cold storage for six weeks, and examined from time to time.

The Dairy Expert (Mr. O'Callaghan) has submitted his report to the Minister on the first series of experiments made with butter manufactured at the Berry Central Factory on the 28th August, 1908.

Weather conditions.—The day was bright and fine, the previous day being similar.

Pasture conditions.—The grass was commencing to spring after the previous fortnight's heavy rain.

Period of lactation.—A great many newly-calved cows were represented in the cream supplied at this time, and hence the keeping quality of butter in the ordinary way would not be as good as it should be at a later stage in the period of lactation, apart from any question regarding the food or pastures.

Age of cream used.—Two days.

Acidity of cream (not quite as ripe as desired).—About ·55.

Manufacture.—The butter proved of excellent grain, and the manufacturing conditions regarding temperature right through were good.

Details of Experiment.

A portion of about 90 lb. of butter from one churn was divided into three equal parts—Nos. 1, 2, and 3. To No. 1, 3 per cent. of salt was added, but no boric acid was included. To No. 2, salt at the rate of 3 per cent., and a preservative, consisting mainly of boric acid, at the rate of 0·25 per cent., were added, the latter having been previously mixed with the salt. To No. 3, salt at the rate of 3 per cent., and the preservative at the rate of 0·5 per cent., were added, having been previously mixed, as in No. 2. The butters were worked and finished in the ordinary way, and packed in 28 lb. boxes. They were then stored two days at Berry, and shipped to Sydney with the ordinary butter consignments of the factory, and placed in cold store on their arrival in Sydney. Previous to placing them in the cold room they were examined, when no noticeable difference in flavour could be detected, the opinion of the examiners—Messrs. O'Callaghan, Stening, and MacInnes—being that No. 2, if anything, had a slightly better flavour than the others.

Points awarded for flavour on first examination, after having been one week in cold store; grading by Mr. O'Callaghan:—

No. 1	... ...	42 points.
2	... ...	$43\frac{1}{2}$,,
3	... ...	43 ,,

Mr. MacInnes' markings—

No. 1	... ...	43 points.
2	... ...	$43\frac{1}{2}$,,
3	... ...	44 ,,

No points were awarded for texture or condition, because the question of manufacture was not being taken into account. The butters exhibited very little difference in this respect.

Second Examination on October 2, about five weeks after the date of manufacture.

Points for flavour and remarks, as graded by Mr. O'Callaghan—

No. 3	... ...	40 points.
2	... ...	$38\frac{1}{2}$,,
1	... ... barely	37 ,,

Remarks.—No. 3. Flavour fair, with a good clean taste; would just pass for a first quality frozen butter as regards flavour. No. 2. Smell, showing evidences of decomposition, though not very pronounced; the taste was not as clean as No. 3. No. 1. The taste and smell in this butter showed definite evidences of decomposition of an undesirable character, and, from the smell, Mr. O'Callaghan arrived at the conclusion that butyric fermentation, or decomposition, was rapidly progressing. This butter would be practically a third-class in flavour.

Mr. Pedersen and Mr. MacInnes placed the butters in the same order, as above, and made practically the same remarks.

Amount of boric acid and water in the finished butters—

	Boric Acid.	Water.
No. 1	Nil.	11·46 per cent.
2	0·13 per cent. ...	12·73 ,,
3	0·26 ,, ...	12·06 ,,

Conclusions.

The first thing to be considered is that a considerable loss of boric acid took place in the working of the butter, reducing amounts present in the finished article to about one-half the quantities added Notwithstanding this, a definite gain and keeping quality was given to the butter to which boric acid had been added; and that to which 0 5 per cent. had been added, and in which only 0·26 per cent remained, retained its flavour so well that it passed for a first quality butter at the end of the five weeks' keeping period; whereas the sample to which no boric acid had been added would be described as a very bad second.

Bacteriological Examination.

These butters were examined bacteriologically from samples taken on arrival of the butter in Sydney, and again from samples taken after butter had been four weeks in cold store. The bacteriological condition of the three butters might be described as good. There were no moulds, and but very few liquefying colonies present in the gelatine plates made at either examination. The number of lactic acid colonies were, however, considerable, and the number appeared to have been as great at the second examination almost as at the first.

Remarks on the apparent prevention of decomposition of No. 3 butter by what appears to have been a very small percentage of boric acid. When considering this question of the inhibition or retarding of bacterial growth by the action of a preservative such as boric acid, the substance that is being preserved must be considered. The addition of considerable quantities of boric acid to ordinary milk does not prevent butyric fermentation therein. But there a substance is being dealt with containing about 87 per cent. of water, whereas with butter the percentage usually averages about 12. It should now be borne in mind that the preservative is in solution in this moisture, and when the percentage of boric acid in the moisture which is contained in this butter (No. 3) is worked out, it comes to 2·15 per cent. Herein lies the secret of its great value as a preservative in butter in small quantities, and also in other substances (such as condensed milk), which do not contain large percentages of water.

Monthly Weather Report.

HAWKESBURY AGRICULTURAL COLLEGE, RICHMOND.

Summary for October, 1908.

Air Pressure (Barometer).			Shade Temperature.				Air Moisture (Saturation = 100).			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 16 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 10 years.	% of the year's Evaporation.
29·87 1	30·43 11	30·11	32·1 10	98·4 30	62·6	63·4	20 7	89 18	59	·393 5	5·379	4·875	11

Rainfall...	Points ...	9½	16	3	8	1	= 37½ points.
	Dates ...	2	18	22	27	31	

Mean for 16 years, 164 points.

Wind ...	N	NE	E	SE	S	SW	W	NW
	7	9	3	2				

Thunderstorms on 30th and 31st.

Greatest daily range of temperature, 48° on 6th.

Days on which temperature rose above 90° ...	93·8°	92·5°	97·5°	98·4°
	6	7	29	30

Frost on 10th.

A dry month, with mean temperature below the average; two heat waves passed over, 6th and 28th.

W. MERVYN CARNE,
Observer.

Meteorological Bureau, No. 4 Division, New South Wales.

Weather Conditions during October, 1908.

S. WILSON,
Divisional Officer.

The month opened with an anticyclone—with its centre to the south of Tasmania—covering the eastern States, over which fine weather ruled generally, excepting on the central coast of New South Wales, where the rear isobars of a departing "low" were causing cloudy, showery, and squally conditions. The heaviest falls were 174 points at Green Cape and 166 points at Gabo. An antarctic depression was also shown on the southern shores of West Australia, between the Leeuwin and Eucla, and resulted in cloudy, showery weather and slight to rough seas. By the following twenty-four hours a great change had occurred in the relative dimensions of the pressure systems, the "high" over the eastern States being now very deflated and occupying one-fourth of its former area, the "low" to the east had slightly retrogressed, whilst the depression to the west had advanced 300 miles eastward. With this distribution, rough to high seas and fresh to strong winds and cloudy or showery weather obtained on the coast south from Port Macquarie. Over inland districts of the continent fine weather ruled for the most part, but on the south-west coast of West Australia unsettled conditions with rough sea had appeared. Between the 3rd and the 9th, two anticyclones and an extensive belt of low pressure over the southern districts of the continent controlled the weather conditions. The high pressure, which on the 1st and 2nd covered the south-eastern half of Queensland and north-western districts of New South Wales, was represented by only one isobar. By the 5th, however, the pressure had increased considerably over the eastern States, the anticyclone now consisting of three isobars.

These barometric conditions were indicative of a slight retrogressive movement. On the 6th and 7th, evidence of still further intensification was shown on the isobaric charts, the central reading at Brisbane reaching 30·36 inches on the latter day.

In the meantime the depression, which on the 5th was rather energetic, had moved eastward, but with daily diminishing pressure, until the 7th, when it covered Victoria and Tasmania, but only contained two isobars. The stagnation of the anticyclone, together with the proximity of the advance isobars of the depression, resulted in a heat-wave which affected various parts of eastern Australia. At Sydney, under the influence of a hot north-west wind, the temperature rose to 90·5 degrees, which represents the highest since February 8th last, when 91·3 degrees was recorded. The extreme temperatures over New South Wales occurred for the most part on the 7th.

In the western districts, at Bourke, 102 degrees was reached, and at Menindie, 100 degrees; on the North-western Plains, Mogil, 93 degrees; Central-western Plain, Quambone and Coonamble, each 99 degrees; Riverina, Hay, 99 degrees; North-western Slopes, Narrabri, Gunnedah, and Quirindi, each 90 degrees; Central-western Slopes, Wellington, 94 degrees; South-western Slopes, Marsden's, and Barmedman, each 92 degrees; Northern Tablelands, Tabulam and Glen Innes, each 84 degrees; Central Tablelands, Cowra, 92 degrees; Southern Tableland, Goulburn, 83 degrees; North Coast, Kempsey, 92 degrees; Hunter and Manning, Jerry's Plains, 95 degrees; Metropolitan, Parramatta, 94 degrees; South Coast, Picton, 94 degrees.

By the 8th, the high-pressure had given way slightly, and permitted the advance of the depression, so that at 9 a.m. only its rear isobars were shown over the eastern districts of our State. Another high pressure, which on the 7th was centrally situated in the south-west corner of West Australia, was, at 9 a.m. on the following day, located 900 miles eastward on the southern seaboard, having travelled at almost double the normal rate. Between the night of the 7th and 1 p.m. on the 8th, a cool squally southerly change swept across the State from west to east, and light to moderate rainfall was recorded in western districts and Riverina. Between the 9th and 16th, two anticyclones and one depression governed the weather of Australia.

The first high-pressure travelled very slowly after reaching the centre of the continent. On the 10th, its centre was shown to the south-east of Adelaide, after which it gradually worked eastward with decreasing pressure until the coastline of New South Wales was passed. It then worked north-eastward and gained slightly in barometric value. The northern isobars of the antarctic depression appeared in the south-west corner of Australia on the 10th, and gradually expanded until the 14th, by which time it had attained abnormal dimensions, covering the greater part of the western half of Australia. On the 15th it was shown over the central districts of the continent, between Northern Territory and the Great Bight, the centre, 29·6 inches, occupying a position to the south-west of Eyre. By 9 a.m. on the 16th the depression had travelled eastward and steepened considerably, its central value now being 29·28 inches on the west coast of Tasmania. With the above distribution of atmospheric pressure during the week, sultry, unsettled, and rainy conditions were experienced more or less generally over the continent.

Splendid rains occurred over western portions of Queensland and New South Wales, as also in South Australia and Victoria, many stations in that area recording amounts of 1 inch and over, some of the falls exceeding 2 inches.

Rough seas were also experienced along the southern shores of the continent, with fresh to strong northerly winds on the advance side of the disturbance, and cool southerly at the rear.

Between the 17th and 24th one anticyclone and one antarctic depression controlled the weather of Australia. The former pressure system was situated in the south-western half on the 17th, after which it advanced very

slowly eastward, and expanded until the 23rd, when it covered the entire continent. At 9 a.m. on the 17th the disturbance was shown over the south-eastern States, where it was responsible for extensive rains, but was gradually dislodged from the mainland as the "high" approached eastward. It thence passed over the Tasman Sea to New Zealand, where it intensified considerably. At the Bluff, to the south-west of which the centre passed, the barometer dropped to 28·98 inches.

Since the 17th, temperatures, on the whole, were rather mild in the day-time and cold at night A few scattered frosts were reported from various districts, particularly on the tablelands and slopes. The lowest temperatures were experienced at Braidwood and Cooma with 20 and 21 degrees respectively; whilst the highest occurred at Coonamble and Murrurundi, with 85 degrees each.

Between the 24th and 31st, two anticyclones and one depression were shown on the isobaric charts. The first of the high-pressure systems travelled across the continent from west to east, and stagnated over the eastern and southern districts. The rear portion of the centre, during the 29th and 30th, occupied a position on the eastern seaboard, between Port Macquarie and Brisbane, and its immobility resulted in a heat-wave over inland districts. Temperatures over 100 degrees were registered on the 30th at Balranald and Hay, with 105 degrees each; White Cliffs and Euston, with 104 degrees; Bourke and Wilcannia, 103 degrees; Cobar, Urana, and Menindie, 102 degrees; Brewarrina, Broken Hill, Wentworth, Cudgellico, Deniliquin, and Jerry's Plain, 101 degrees.

Unsettled thundery conditions set in, chiefly over the eastern and north-eastern districts of New South Wales, between the 26th and 29th inclusive, and resulted in some light to heavy rainfall there. The largest amounts were recorded on the Northern Tablelands. During that period, Glen Innes had 144 points; Emmaville, 105; Camden Haven, 91; and Tabulam, 63 points.

Light to moderate falls were also reported from the extreme south-west corner of the continent, and at a few scattered places in the eastern districts of Queensland.

COMPARISON WITH INDIA.

The following is a statement showing a brief comparison of the chief meteorological elements over India, together with Australia, as far as data are available, for the month of October, 1908:—

	Departure from normal.		General Conditions (referring to State as a whole).
	Pressure.	Temperature.	
	inches.	degrees.	
Simla (India) ...	− ·02	+0·4	Very dry.
Sydney (N.S.W.) ...	+ ·09	− 1·2	Above over greater part of Western Division, northern portion of Central-west Plain, and at a few isolated places in Riverina and N.W. Plain; otherwise rainfall generally below average.
Melbourne (Victoria)	+ ·07	+0·2	Rain well above average, western half; slightly below elsewhere.
Adelaide (S.A.) ...	+ ·08	− 0·2	Above normal except interior and portion of W. coast.
Perth (W.A.) ...	+ ·03	+0·6	Generally below average except scattered places in S.W. and south.

Judging from the foregoing table, a rather extensive area of country, comprising the greater part of South Australia, Western Division of New South Wales, and scattered places along the Great Bight and south-western districts of Western Australia, has had rainfall above average, otherwise fairly dry conditions have prevailed generally. It has also been very dry in India.

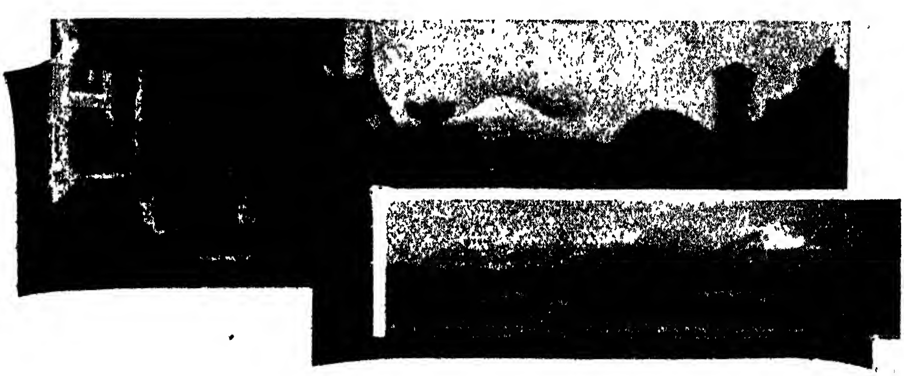
Higher pressure than is usual for the month of October has been experienced over the Australian States mentioned above, but in India it has been slightly less than normal.

At Perth, Melbourne, and Simla (India) temperature was in excess of, but at Adelaide and Sydney below, the average, the latter city being 1·2 degrees in defect.

CLIMATOLOGICAL Table for the month of October, 1908, compiled from daily telegraphed returns.

Station.	*Mean Barometer at 9 a.m.	TEMPERATURE.							Rainfall, Inches.
		Mean Maximum.	Mean Minimum.	Absolute Maximum.	Date.	Absolute Minimum.	Date.	No. of days below 40 deg.	
Walgett	30·16	80·2	52·9	96	31	32	9	1	1·14
Bourke	30·10	84·9	53·0	103	30	37	9	2	0·76
Wilcannia	30·08	81·3	53·7	103	30	40	10	0	0·75
Wentworth	30·13	79·3	52·0	101	30	33	9	1	2·81
Hay	30·04	81·7	45·1	105	30	32	1 & 20	10	1·39
Deniliquin	30·08	75·4	49·0	101	30	35	10	6	1·03
Albury	30·06	72 0	46·6	95	31	33	2	5	1·50
Forbes	30·09	74·8	50·3	95	30	32	10	4	0·45
Dubbo	30·06	79·8	48·7	97	30 & 31	31	7	7	0·35
Clarence Heads	30·19	71·4	55·1	79	19 & 26	33	9	1	1·26
Port Macquarie	30·11	69·9	50·4	81	6	38	19	1	0·52
Newcastle	30·08	70·3	54·3	91	30	41·0	10	0	1·44
Sydney	30·092	70·6	53·7	90·5	7	45·1	9	0	1·333
Jervis Bay	30·07	65·1	51·1	80	31	42·0	20	0	2·11

* Corrected to 32 deg. F. and M.S.L.



Orchard Notes.

W. J. ALLEN.

December.

Exporting Apples.—It is time to make arrangements for space in boats if fruit is to be sent to Europe this coming fall. It would be well for those who have a good crop to arrange to send a trial shipment, be it ever so small, either in conjunction with some person or company who are exporting, or better still, through the medium of the Fruit Growers' Union.

Irrigation.—Where irrigation is practised it will be found necessary in most cases to give the soil a good soaking this month. Where young trees or vines are being watered, see that the soil is well soaked around their roots, and as soon as the ground is dry enough after the watering, cultivate the land thoroughly and work around the trees and vines with a fork hoe.

Fruit Curing.—Apricots will be the principal fruits for curing this month. See that the fruit is perfectly ripe before picking; then cut them evenly, fumigate, and put them out in the sun with as little delay as possible. Do not cure them too much, but take them in when yet quite pliable, after most of the moisture has left them Pamphlets on curing fruit may be had on application to the Department of Agriculture, which will give all details in connection with this important work. (Fruit drying, Miscellaneous Publication No. 919; Canning and Bottling, No. 999.)

Cultivation.—All orchard land should be kept free from weeds, and to this end the horses and cultivators should have but little rest this month, as an orchard neglected for a few days will soon be covered with a coating of summer grass which will take many a hard day's work to eradicate; and couch grass spreads rapidly when left undisturbed. Where there are bad patches of couch grass, they should be ploughed up and harrowed on a very hot day, as the roots soon die when exposed to the sun.

Passion vines which have been properly pruned and manured during November will now be putting on good growth and blooming freely. This fruit will be ready to meet the demand at Easter, when it usually finds a ready sale at good prices.

Pests.—Keep a strict lookout for pests, and if trees have not been fumigated or sprayed, as the case may be, the grower should lose no time before beginning to fight them.

For scales on citrus trees December, January, and February are good months for either spraying or fumigating, but for fungus diseases it is generally best to spray once before the tree blooms and again as soon as the fruit has set, rather than leaving it until now. In many cases, however, later

sprayings are both beneficial and necessary. The grower should not neglect to either fumigate or spray all citrus trees so as to ensure clean fruit and healthy trees, but do not treat trees that are weak and out of condition, else they may be damaged.

Complaints have been made by a few orchardists, of the burning of the foliage, after spraying with arsenate of lead. As there are several brands on the market, it would be well for orchardists to apply the spray to a section of a tree of the different varieties in the orchard, as by making such tests one is enabled to ascertain if the mixture is too strong; and, if so, the quantity of arsenate of lead may be reduced, so that no scorching or damage to either leaves or fruit will occur. Some varieties are more tender than others, and by carrying out experiments as described above, the grower will know to reduce the strength of the arsenate of lead when spraying such varieties. The first spraying to be given just as the petals are falling, should be the strongest application, while for subsequent sprayings, the quantity of arsenate of lead may be reduced to 1½ lb. to 50 gallons of water, and it may be found that for some brands of arsenate of lead, 2 lb. to 50 gallons will be quite strong enough for the first application.

By testing the spray on a few trees before proceeding to treat the orchard, the possibility of damaging foliage or fruit may be avoided.

Codling Moth.—Keep a strict watch over bandages on the apple, pear and quince trees, and see that all fruit is picked up and destroyed either by feeding it to stock immediately, or boiling or burning it: but not by burying it, as a few of our careless growers have tried to do. It is to the interest of every grower to see that every grub is destroyed before it can fly. The man who buries his fruit is only breeding moths for himself and his neighbours, and therefore it is hoped that in the interests of the fruit industry, any growers found resorting to this means of disposing of their fruit, will be reported to the Inspectors and made an example of. We hope that growers will assist the Inspectors in every way possible, and where they know of those who are trying to evade the Act, they will report them.

Fruit Fly—As soon as this pest makes its appearance set kerosene traps around the trees or hang them in the trees. These traps are tins about 5 or 6 inches square, 2 inches deep, with a half inch of kerosene in the bottom. Pick up and boil or burn all fallen and infested fruit every day.

Pineapples.—In tropical districts pineapples may be planted if moist weather prevails. Suckers are the best to plant, being much the strongest and earliest to arrive at maturity. Being great feeders, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young, cultivation must be thorough but not deep enough to cut the feeding roots, which are near the surface.

Bananas and other tropical fruits may also be planted during the rainy season.

The dry weather on the coast is still the cause of great anxiety to most of our growers, and in many cases the prospects for the coming season's citrus crops are anything but promising.

Farm Notes.

Hawkesbury District—December.

H. W. POTTS.

We are having another spell of dry weather, and although not quite unseasonable, it has suited most of the farmers in the Valley and enabled hay-making of cereals to be conducted successfully. The yields this year are far ahead of those of the last two seasons. The rainfall has been more generous, although far from the normal. During 1906-7 we had a little over 16 inches, and this year 22½ inches have been registered so far. On the flats, hay crops have given up to 2½ tons to the acre, whilst on the uplands ½ to 1 ton to the acre crops are not uncommon. These weights chiefly apply to the early sown crops.

The first cut of lucerne provided a fair return, but owing to scarcity of rain now the crops are almost dormant.

Where it is intended to increase the area under lucerne, a favourable opportunity now offers to turn in the stubble of the hay paddocks, cultivate thoroughly, and grow a crop of cowpeas. The land must be clean and naturally fertilised, ready for laying down in lucerne during the wet months of autumn. It will be advisable to add ½ ton of gypsum to the acre prior to sowing the cowpeas.

Maize.—Owing to prevailing hot westerly winds, the young crops of maize are being subjected to severe conditions, in addition to the absence of rain. Our only hope of relief is from occasional thunderstorms.

Every opportunity should be seized to practise shallow cultivation, to stir the surface soil between the drills, in order to establish an effective earth mulch and check evaporation. The supplies of subsoil moisture are almost exhausted. Whenever rain falls, be it light or heavy, the cultivators should be brought into use immediately afterwards to conserve moisture. It is only by assiduous attention to this work that a crop will be secured with our present outlook.

It will be necessary to make provision for future sowings of maize for ensilage up to the end of this month, in order to provide food for the winter. The following varieties may be planted:—Red Hogan, Golden Beauty, Hickory King, and Early Mastodon. Should the season prove favourable, a satisfactory yield of grain may be expected from any of these.

Millets.—The crops of this useful fodder sown in September are not promising, owing to the scanty rainfall. Where they are drilled it will be necessary to keep up constant cultivation to ensure a medium crop. Fresh sowings may be made this month.

Sorghums.—In the past we have relied on sorghums to furnish us with a good stand of green fodder for early winter, in fact into July. The special feature to be remembered is that sorghum is not adversely affected by early frost, as is the case with maize. It is wise to make provision this month to meet the demand for green food at a period when all other fodders of a similar nature are scarce.

What is not eaten as green fodder can be readily converted into ensilage or cut and stooked to dry as hay.

The land may be cultivated and got ready at once, brought into fine tilth and manured, as for maize. When the young plants appear above ground cultivation must be continued right through the early changes. The delicate nature of the young plant is well-known, and more attention is required with it at that stage than is needed to stimulate the young life of maize.

Cowpeas.—This plant provides a juicy appetising class of food for stock during the months of February and March, when other fodders are either dry or out of season. All classes of stock soon become accustomed to this fodder and thrive well on it. The outlook points to provision being necessary for green feed in the middle of summer. We are evidently facing a dry hot season.

Cowpeas thrive on light sandy soil, and are hardy, drought resistant, and profitable. The crop may be grazed, and as such it is most useful. It can also be converted into hay or ensilage, so that should the forecast be otherwise than that quoted, the fodder can be conserved.

The soil should be brought into a fine condition and manured with superphosphate from 2 to 3 cwt. to the acre.

The peas may be planted in drills 3 feet apart, with the seed 6 to 8 inches distant. From 7 to 10 lb. of seed is needed per acre.

The best varieties to grow are Poona, Black, Warren's Extra Early, Warren's New Hybrid, Whip-poor-will, Iron, and Clay.

Pumpkins, Melons, Squashes, Marrows, and Grammas.—Further sowings may be made for the purpose of raising stocks to preserve at the end of summer for winter feed. The dry weather necessitates constant attention to the plants now growing. All require mulching.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Sub-Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1909.

Society.	Secretary.	Date.
Dapto A. and H. Society	G. A. McPhail	Jan 13, 14
Kiama A. Association	R. R. Somerville	,, 26, 27
Gosford A. and H. Association	W. E. Kirkness	,, 29, 30
Alstonville A. Society	W. W. Monaghan	Feb. 3, 4
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 3, 4
Wollongong A., H., and I. Association	F. W. Philpotts	,, 4, 5, 6
Moruya A. and P. Society	John Jeffery	,, 10, 11
Shoalhaven A. and H. Association, Nowra	Henry Rauch	,, 10, 11
Guyra P., A., and H. Association	....	,, 16, 17
Pambula A., H., and P. Society	J. B. Wilkins	,, 17, 18
Kangaroo Valley	E. G. Williams	,, 18, 19
Wyong A. Association	J. C. Martin	,, 19, 20
Tamworth A. Association	J. R. Wood	,, 23, 24, 25
Central Cumberland A. and H. Association	H. A. Best	,, 24, 25
Manning River A. and H. Association, Taree	S. Whitehead	,, 24, 25
Gunning P., A., and I. Society	W. T. Plumb	,, 25, 26
Nambucca A. and H. Association, Macksville	M. Wallace	,, 25, 26
Tenterfield P., A., and M.	F. W. Hoskins	Mar. 2 to 6
Bega A., P., and H. Society	W. A. Züegel	,, 3, 4
Bellinger River A. Association	S. S. Hindmarsh	,, 3, 4, 5
Nepean District A., H., and I. Society, Penrith	Percy J. Smith	,, 4, 5
Berrima District A., H., and I. Society, Moss Vale	I. Cullen	,, 4, 5, 6
Bombala Exhibition Society	W. G. Tweedie	,, 9, 10
The P. and A. A. of Central New England, Glen Innes	George A. Priest	,, 9, 10, 11
Molong P. and A. Association	Charles E. Archer	,, 10
Campbelltown Agricultural Association	Fred Sheather	,, 10, 11
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 10, 11
Bowraville A. Association	C. Moseley	,, 11, 12
Crookwell A., P., and H. Society	M. P. Levy	,, 11, 12
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Newcastle A., H., and I. Society	C. W. Donnelly	,, 11, 12, 13
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Society.	Secretary.	Date.
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Parkes P., A., and H. Association	G. W. Seaborn ...	,, 25, 26
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[1 Plate.]

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